COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers

Pull-out RF spectrum wall chart

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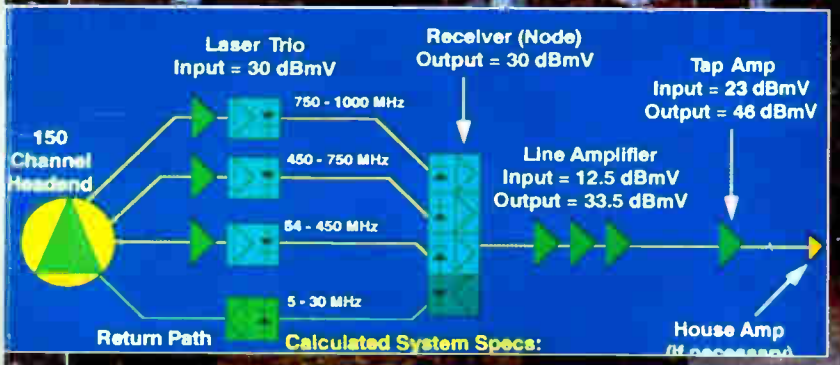

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February 1992

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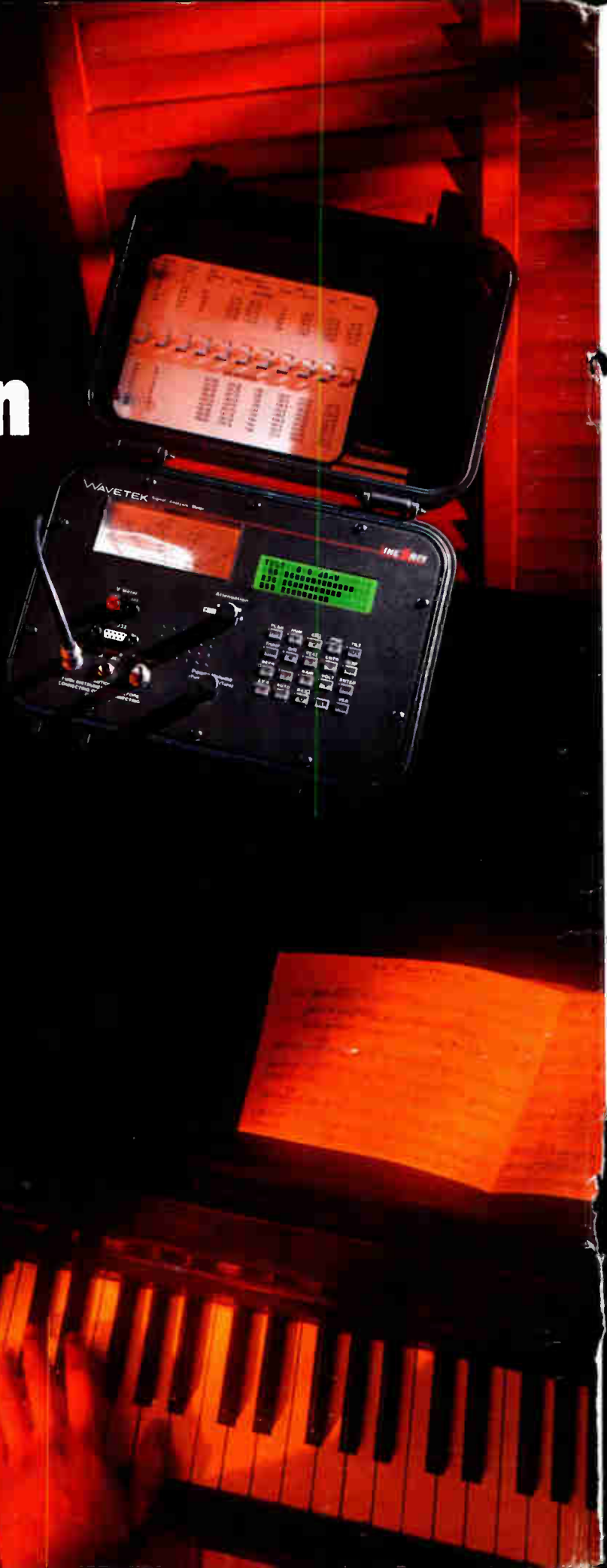

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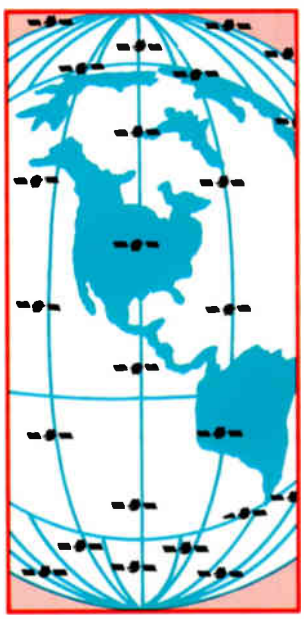

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Theft of service photo courtesy of the National Cable Television Association. Inset diagram of Queens 1 GHz system courtesy of Time Warner.

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ONI OPTICAL NETWORKS INTERNATIONAL

Optical Network News

The following highlights are from Optical Networks International's quarterly newsletter.

Will digital really play on an analog system?

AT&T Bell Labs has begun concentrating on the real world effects of digital on analog. Does a digital signal interfere with the current analog system, or vice versa? What is the optimum level at which a digital signal can be transmitted below the analog signal? What are the capabilities of each of the various modulation schemes? Answers to these and other questions are imperative for the industry's seamless integration of digital technology into existing systems. (See related story in the Spring 1992 issue of ONN.)

How much better is better?

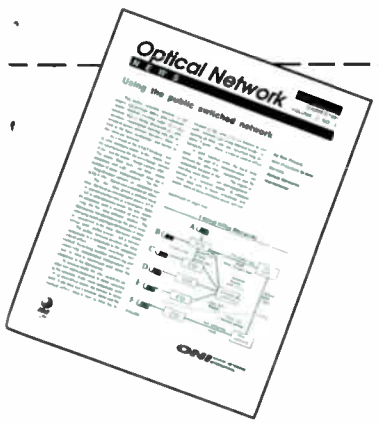
Reliability is a key factor in the customer's perceived value of cable service. With fiber optic deployment becoming the norm, we know that system reliability is being improved. But by how much? Longitudinal studies must be undertaken to quantify improvements in many areas of system operations. Results of these studies will provide operators with the empirical data required for business customers with alternative access applications, and will also assist in planning and budgeting for efficient system maintenance. (See related story in the Spring 1992 issue of ONN.)

The cart or the horse?

As the cable industry continues to focus on new technology, its implications for new business and marketing opportunities must be explored. To what extent will market demand drive the deployment of advanced technology? For example, if near video-on-demand trials are successful, will compression development be accelerated? What about "smart" headends? Fiber deployment? Addressing these issues will ensure that technologies are being developed in support of business objectives. (See related story in the Spring 1992 issue of ONN.)

Winter ONN issue just released

The Winter issue of the Optical Network News features an article by Tom Jokerst of CableLabs and an introduction to ONI's new Digital Services Group (DSG). If you would like a FREE copy please return the coupon below.



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EDITOR'S LETTER

Whatever happened to CLI?

Talk about something that came in like a lion and went out like a lamb. I'm referring, of course, to the hoopla surrounding cumulative leakage index (CLI) requirements a couple years ago. We had been warned about the tough new rules for five years preceding their official implementation. Manufacturers scrambled to get new leakage measurement equipment to the market, numerous CLI software packages were developed and cable operators rushed to get systems into shape.

A CLI anticlimax?

CLI and signal leakage technical seminars often were standing room only, and we were advised by Federal Communications Commission officials that failure to comply with Part 76 would result in harsh penalties that included large forfeitures (fines) and possibly the shutting down of offending channels. System operators who didn't take the new rules seriously would be made examples of. Companies doing flyovers were booked for months in advance, and many systems that couldn't spare their own personnel hired contractors to perform ground-based measurements.

Come July 1, 1990, the last of the new Form 320s were sent to the FCC. The deadline came and went, and the CATV industry breathed a collective sigh of relief. Soon the commission's field inspectors began to visit a few systems, and some operators were indeed fined for leakage infractions; a handful were asked to turn off channels on aeronautical frequencies until the leaks were repaired.

A CLI conspiracy?

Faster than it all began, the excitement seems to have all but disappeared. What has happened to CLI? With the exception of an article or two in our trade press, there has been almost nothing about this once hot subject. I suspect that if a leakage seminar were held today, attendees could have their choice of seating. And there certainly haven't been many operators in the "bad example" spotlight.

I even heard a rumor that political pressure is being put on the feds to make CLI a non-issue. An interesting rumor, but I have a tough time believing it. If true, though, it would certainly be one explanation for the apparent demise of this subject. (Of course, conspiracy theories always seem to be in vogue — look at the popularity of the movie *JFK*.) So I decided to conduct another one of my *very* informal and unscientific surveys.

I talked to a few folks at the recent SCTE fiber conference in San Diego, and while CLI hasn't been in the news much, most of those I spoke with indicated that it is definitely an ongoing concern. What seems to have happened — in most cases, anyway — is that preparation for the first filing really uncovered a lot of leakage problems. By the time the '91 filing deadline came around, procedures were pretty much in place and the worst of the problems had been taken care of. There is no question it was much easier the second time through.

One operator I spoke with said his first flyover for 1990 netted a 94 percent compliance, and in 1991 his system got a 99.6 percent. His goal for this year is to do even better than last. Monthly frequency checks are performed, and regular monitoring covers a minimum of three-fourths of the entire plant each quarter. Routine leaks are repaired in no more than 30 days, and really bad ones are fixed the same day they are found. Other operators had similar reports.

So maybe we are doing a good job with leakage and CLI after all. Perhaps our efforts to clean up our plants are working. But then, what if there really is a conspiracy to get rid of CLI? It does cost a lot of money, you know. Hmm ...

Ronald J. Hranac
Senior Technical Editor

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LETTERS TO THE EDITOR

Reflection back talk

"Back Reflection in AM fiber CATV systems" by Vedrana Stojanac (*Communications Technology*, September 1991) contains misleading and unduly alarmist statements about optical reflections.

The article states that: "In a good quality fiber the actual amount of backscattered light captured by the core and carried back toward the transmitter due to Rayleigh scattering is very low, typically in the order of 65 dB below the transmitted signal." Without specifics, this statement is anywhere from meaningless to misleading. Let me explain. First, the *meaningless* interpretation.

If by referring to backscatter, Stojanac means the downward sloping line displayed on an optical time domain reflectometer (OTDR), then the level of this line can certainly be 65 dB "below the transmitted signal." However, this is true only under certain conditions. One such condition, for example, is if the

OTDR pulse is 25 nsec wide at a 1,310 nm wavelength on AT&T conventional single-mode fiber. But such specifics are not stated. If the pulse width were doubled to 50 nsec, then the captured Rayleigh backscatter would double also — to 62 dB. So, Rayleigh backscatter is not a singular number. It depends on pulse width, wavelength and fiber type. To simply state a number such as 65 dB as a typical Rayleigh scattering level is meaningless.

Now, the *misleading* interpretation.

Stojanac concludes that because Rayleigh scattering is "in the order of 65 dB ... It is therefore known that the components in the system are the key factors contributing to reflection loss." The implication here is that components having reflections worse than 65 dB are the "key factors contributing to reflection loss." Stojanac is comparing apples and oranges. AM systems (the apples) are not OTDRs (the oranges). AM systems do not just turn lasers on for 25 nsec, generate a 65 dB reflection, and then sit dormant. AM lasers are on all the time and generate a continuum of low-level backscatter reflections that add up to a much larger reflection at the fiber's input. It's well known that this reflection is 49 dB at 1,310 nm for 100 meters of fiber and almost 31 dB for fiber lengths greater than 10 km. (A. F. Judy, "Reflections and Fiber Video Systems," Southcon '91, p. 181-188.) The 31 dB figure is a far cry from Stojanac's 65 dB, and it's this fiber reflection itself that requires DFB lasers in AM systems

to be equipped with optical isolators. The bottom line is that a 40 dB splice buried in 10 km of fiber wouldn't even cause an AM system to hiccup.

My last comment relates to the statement in the article that "CATV systems operate at VHF and UHF frequencies, typically at 300 to 400 MHz with the newest systems operating at 550 MHz or greater. The influence of back reflection at this bandwidth is substantial." Wow! Where is Stojanac's evidence for such a statement? It contradicts published studies. As shown by Judy in Figure 3 of the previously cited paper, the relative intensity noise (RIN) caused by optical reflections is almost constant with channel frequency. If anything, RIN actually improves at higher carrier frequencies. For example, the RIN of Ch. 78 at 547.25 MHz is less than that of Ch. 2 at 55.25 MHz.

I hope I've provided enough information to show the deficiencies that permeate the article. Unfortunately, because readers unfamiliar or only partially familiar with reflections will not be aware of this misinformation, their anxiety will be unjustifiably heightened. Gee ... they might even go out and buy some back reflection test sets to assess the severity of the problem in their own fiber installations!

James J. Refi
AT&T Network Systems

Author's response: My intent in the article was to introduce instrument operators and non-technical staff working in the CATV industry to fiber; the objective was a non-technical overview. This should have been evident in the introduction where a simple statement of the benefits of optical fiber (i.e., low loss, small size, etc.) was made. Relative to fiber optics, I continued with a definition of reflection, presented the two classifications of reflections, gave examples of where reflection can occur, and introduced some equipment for measuring reflection. In no way was a simple "If ... then buy reflection testing instruments" equation given to the reader.

I felt that introducing too much analysis such as that of OTDR operation and the concept of RIN, was beyond the scope of the article. The backscatter being 65 dB below the transmit signal statement was a mere general example — a figure to say how weak this signal can be. I have read similar unconditional statements in technical magazines and have understood them in the context in which they were written. And to say that Fresnel reflections contributed more reflection again was a general statement; I did not intend to cause alarm over a single splice in a 10 km span.

"CATV systems operate at VHF and UHF frequencies, typically at 300 to 400 MHz with the newest systems operating at 550 MHz or greater. The influence of back reflection at this bandwidth is substantial." This means CATV systems operate at a certain frequency and reflection exists. I did not compare reflection levels at different operating frequencies. The bottom line was that CATV systems can fall victim to reflection problems.

In closing, I would like to say that Refi has added important information while viewing the article at a level that it did not aim to achieve. I have now learned that I cannot boldly state that 1 + 1 = 2, but that I should explain that 1 + 1 = 2 if not in base 2, under which condition 1 + 1 = 10.

I apologize for my imprecise statements.

Vedrana Stojanac
EXFO Electro-Optical Engineering

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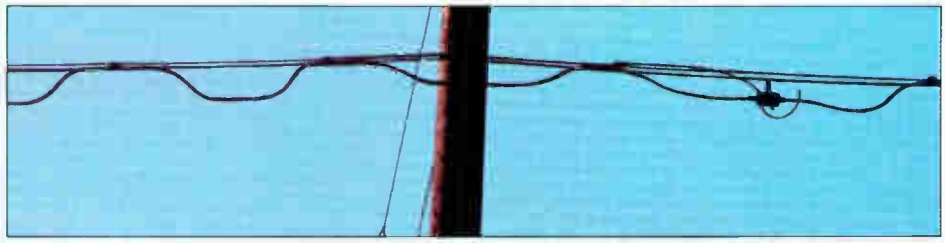

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Reader Service Number 11

Fiscal results released by vendors

DENVER — Some of the CATV vendors announcing fiscal results recently were California Amplifier, C-COR, Texscan and Tektronix.

Cal Amp reported its highest earnings since 1983. Sales for the quarter ended Nov. 30, 1991, were $5.4 million, a 42 percent increase when compared to sales of $3.8 million for the same period in the prior year. Net earnings for the the quarter of $471,000 (or 10 cents per share) compared to a net loss of $536,000 (or 12 cents per share) for the third quarter of the prior fiscal year.

C-COR announced results for the second quarter ended Dec. 27, 1991. Net income of $271,000 on sales of $11.07 million was reported. This compares to a net loss of $849,000 on sales of $7.97 million for the same quarter of the previous year. Earnings per share for second quarter '91 were reported as 6 cents per share, which compares to a loss per share of 19 cents for the same quarter in 1990.

Texscan sales for the second quarter 1991 were reported at $10.3 million vs. $9.4 million for the same quarter in 1990. Net income was 5 cents per share, which compares to 10 cents per share for 1990's second quarter.

Tektronix reported second quarter 1991 sales as $303.2 million vs. $309.4 million in 1990. Net income was reported as 27 cents per share vs. 41 cents per share in 1990.

CableLabs issues digital insertion RFI

BOULDER, Colo. — Cable Television Laboratories' recently established compressed digital commercial/program insertion task force issued a request for information to more than 200 companies that have shown interest in digital insertion equipment and services. The deadline for responses was set for Feb. 3.

Chaired by Chris Bowick, group vice president/technology and chief technical officer for Jones Intercable, the task force intends to establish voluntary technical guidelines for compressed digital commercial program insertion systems. Since the existing system of using a network of video cassette players controlled by various operating software/firmware systems (which often are not interoperable) is labor-intensive, it is believed that changing over to compressed digital signal processing and electronic distribution will resolve some of the problems.

CableLabs also recently received nine responses to its request for proposal (which it jointly issued with Tele-Communications Inc., the Viacom Networks unit of Viacom International, and the Public Broadcasting System) for digital compression program delivery systems. Respondees to the RFP were AT&T, ComStream Corp. and News Datacom; C. Itoh & Co.; the Digital Television Consortium (Oak Communications, Leitch Video International, and C-Cube Microsystems); General Instrument's VideoCipher division; Macrovision; Magnavox CATV Systems/Philips Electronics N.V. and Hughes Network Systems; Scientific-Atlanta/Zenith Electronics; Thomson Consumer Electronics (supported by the David Sarnoff Research Center); and Toshiba's Imaging and Information System division. The RFP is intended to result in acquisition of equipment for digital compression program delivery systems.

In other Labs news, Le Groupe Vidétron Ltée. and Shaw Cablesystems Ltd. joined CableLabs. This adds more than 1.5 million subscribers to the consortium's membership pool and means 45 percent of Canadian cable subscribers are served by its member companies.

Finally, the CableLabs board of directors approved a total fiscal year 1992 budget of $13 million, including depreciation.

C-COR hires employees back

STATE COLLEGE, Pa. — C-COR announced in mid-December that 130 temporary workers who had been called back over the last several months have become regular, full-time employees. Primarily involved in the manufacturing of product, these workers are split evenly between the State College and Tipton, Pa. plants. As well, C-COR said that as of the beginning of January, 25 more workers in each of the two facilities were rehired or recalled and given regular, full-time status.

CATV pirate jailed, seven others arrested

SIERRA VISTA, Ariz. and DALLAS — An Arizona man was sentenced to four years in prison and ordered to pay more than $4,000 in fines and restitution after pleading guilty to 12 counts of theft of cable TV service and forgery. Desert Cablevision is to receive $2,000 in restitution from Ferris William Heller (a.k.a. Ralph Heller), who was arrested in April for illegally selling thousands of cable decoders and was previously convicted in 1986 for satellite piracy of cable TV programming.

In Dallas, special agents from the FBI arrested seven residents in a case involving the manufacture and use of computer chips designed to descramble cable TV signals illegally. The victimized company, Tele-Communications Inc. of Dallas estimates it loses $10 million a year to theft of basic service. The men arrested were contract installers for TCI and no TCI employees were targeted in the raid.

In more TCI and cable theft news, the company said it substantially completed its internal investigation of its subsidiary's cable operations in Chicago and confirmed that customer theft of service is "unacceptably high" in the system. In a press release, TCI announced it will "move swiftly and aggressively to correct this problem" and has already initiated changes in the management of the system. The investigation had not disclosed senior management involvement in any violations of law relating to theft of service.

S-A inks two deals

ATLANTA — Scientific-Atlanta announced it entered into a partnership agreement with Turner Broadcasting System for the introduction of the Checkout Channel. Also, S-A (along with Thomson Consumer Electronics and News Datacom) made a deal to cooperate in the development of a new set-top terminal for international cable TV and terrestrial markets that use the VideoCrypt signal security and scrambling system.

The Checkout Channel is the first live news and information TV network to be viewed at supermarket checkout lanes, which was scheduled to debut recently. S-A will supply uplink and downlink equipment including its Model

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DX ANTENNA

Reader Service Number 12

9708 integrated receiver-decoder, S-A's first "compression-ready" product. Both S-A and TBS will provide financing for the venture.

In the VideoCrypt deal, the new set-top terminal will include the user-friendliness of S-A's Model 8600 that eliminates a user's manual and confusing message symbols, according to the company. Possible features include on-screen displays and easy ordering and on-screen confirmation for pay-per-view. The VideoCrypt system was jointly developed by Thomson Consumer Electronics and News Datacom and features smart card security, conditional access and scrambling technology.

Hughes to move AML line to Canada

TORRANCE, Calif. — Hughes Aircraft Co. announced it is moving its AML product line from Torrance to the company's operation in Winnipeg, Manitoba, Canada. Reasons for the move are said to include gaining leverage and assistance in reaching emerging international markets and Canadian government support programs for research and development.

According to Clifford Gorby, AML product line manager, field sales and service personnel will not be affected by the changeover, and that during the transition the company will run parallel manufacturing operations in Winnipeg and Torrance to assure production delivery schedules and service commitments continue to be met. He also reported that the company will establish a spare parts distribution center in the United States and will use a freight forwarder in Minnesota to assure easy shipment of equipment returned for repair.

- General Instrument and MIT demonstrated their all-digital HDTV DigiCipher system in GI's Washington, D.C., office to members of the local and trade press, who saw one of only two compact prototypes with just two equipment racks (one each for the encoder and decoder). The second unit was installed at the Advanced Television Test Center in Alexandria, Va., where the testing of six proposed ATV systems is taking place.
- Jerrold is providing wireless cable TV equipment to two major operators in Mexico: Multivision in Mexico City, and Ultravision in Vera Cruz and Puebla. The Multivision deal is worth approximately $22 million over the next five years and the Ultravision agreement is worth about $550,000, according to Jerrold.
- California Amplifier and Pan Asian Systems (a company controlled by the Hutchison Whampoa Group in Hong Kong) penned a distribution agreement wherein Pan Asian systems will act as Cal Amp's master distributor in the Asian region. This includes China, Japan, India, South Korea, Hong Kong, Indonesia and Thailand.
- EXFO E.O. Engineering moved its main office and manufacturing plant to a new facility that almost doubles the firm's total floor space. The new address is 465 Godin, Vanier, Quebec, Canada G1M 3G7; all phone/fax numbers remain the same.
- United Artists Cable of Tulsa's parent company, Tele-Communications Inc., is to construct a modified fiber upgrade and rebuild of the Tulsa, Okla., system. Construction is set for the first quarter of this year.
- M/A-COM-LCS moved to a new facility at 6 Wentworth Dr., Hudson, N.H. 03051. The telephone is (603) 883-8300 and the fax is (603) 883-8134.
- AdStar has contracted Dynatech Cable Products Group to design and manufacture a new generation of equipment that fully integrates the insertion of national, regional, local and promotional advertising in cable systems. Dynatech Cable Products Group is a recently formed effort of Dynatech Corp.
- CableReady Inc. acquired the Cable Pro tool line. The deal was effective Feb. 1.
- Hughes Communications' area code in El Segundo, Calif., changed to (310). None of the company's telephone numbers are affected — only the area code.
- US West and Tele-Communications Inc. agreed to combine their U.K. cable TV and telephone operations. The partnership will participate in franchise with 2.9 million homes.
- Paul Nickless and Robert Schirmer, formerly of Midwest Communications Corp. (which filed for Chapter 11 bankruptcy last June), formed Nickless Schirmer and Co. Inc. It will do business as NSC Communications and will supply the cable TV and private cable industries with products from prominent headend and satellite reception equipment manufacturers. The new company is at 7745 Foundation Dr., Suite 1, Florence, Ky. 41042; (606) 727-6640.

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Reader Service Number 14

Conference success: Fiber Optics Plus '92

(Submitted by Ron Hranac, Senior Technical Editor, "Communications Technology")

SAN DIEGO — Despite the combination of the continuing recession and blizzard conditions in Denver that hampered the travels of many en route to Southern California, the Society of Cable Television Engineers' fourth annual fiber conference can only be summed up as another success. This year's gathering departed somewhat from previous fiber-only themes, as its title "Fiber Optics Plus '92" suggests. Emerging technologies such as digital compression and transmission, advanced photonics, large screen displays, and NTSC picture impairments were discussed along with fiber. The two-day conference drew 590 attendees, up slightly from last year's 573.

Following opening remarks by SCTE Executive Vice President Bill Riker, Cox Cable's Alex Best commented that fiber has grown from a "trust me, it'll work" technology to having the widespread acceptance it enjoys today. Best moderated the first morning's sessions, which concentrated on the operational impact of fiber optics. Speakers confirmed the trends our industry has seen since the introduction of AM fiber in 1988: improved system reliability, better signal quality, and reduced operating costs (especially in the area of system powering with fiber-to-the-feeder type architectures). There is little argument that new-builds incorporating

FTF designs now can be done for about the same costs — and often less — than traditional all-coax builds.

The first day's luncheon keynote speaker was ATC's Jim Chiddix, who was asked at the last minute to pinch-hit for Antec Chairman and CEO John Egan, who was stranded by the weather-related air travel delays. Chiddix provided an overview of the evolution of optical communications in our industry, and noted that the hybrid architectures developing today are taking advantage of the benefits of fiber to create new revenue possibilities. He cautioned attendees not to fall into the trap of letting "technology drive new business," reviewing the failures of CATV-related technology developed without a market nearly two decades ago. Chiddix added that the proper role of technology is to "*enable* business if there is a marketplace demand."

Although new developments continue to be made in fiber, there wasn't any earth-shattering news announced at this year's conference. The 1,550 nm technology — including optical amplification — is improving and coming down in cost, but we're not likely to see any practical breakthroughs in 1,310 nm optical amplifiers in the near future. And even though an individual single-mode optical fiber has a theoretical bandwidth sufficient to carry in excess of 1 million NTSC TV channels simultaneously, it was pointed out that three fibers are necessary with today's available technology to carry the 1 GHz downstream spectrum in ATC's Queens, N.Y., upgrade. Two presentations in particular caught this editor's attention:

Israel Levi of Harmonic Lightwaves described the theory and operation of the company's externally modulated laser that was introduced in November at the Western Show. The RF predistortion compensation approach used by Harmonic Lightwaves seems to overcome the distortion problems inherent with external modulation without the complexity of techniques such as optical feedforward compensation, which requires a second laser in the transmitter. Some in the industry have been skeptical of the viability of external modulation schemes for certain CATV fiber applications, but developments such as this may soon silence the critics.

Adelphia Cable's Joseph Selvage presented an interesting design concept for coaxial plant called "neutral networks." Adelphia's approach modi-

fies conventional design rules to allow fiber technology to be cost-effective in all housing densities by making the coaxial system neutral to signal flow.

The second day's keynote luncheon speaker was David Lang of AT&T Bell Laboratories, who painted a picture of the expected direction of technology through the year 2000. Commenting that "change is a constant factor in this business," Lang predicted 1 Tb/sec data rates and multi-GHz electronics, IC chips with a billion transistors each, microprocessors capable of 1,000 MIPS, and even hundreds of digitally compressed channels in a 1 GHz bandwidth by the turn of the century. He added that "the challenge is to cope with these rapid technological changes."

Consultant Bronwen Lindsay-Jones presented a summary of a study done for CableLabs involving viewing distance and the perceptibility of impairments such as noise and distortion on NTSC picture quality. Today's viewers are much more cognizant of good picture quality, and the results of the study suggest that our targets for parameters such as subscriber drop carrier-to-noise ratios should favor numbers in the range of 48 to 50 dB.

If you missed this year's conference, most of the papers presented have been published in a 258-page proceedings manual available from SCTE. The conference also was recorded, and videotapes will be available from the Society. For more information, contact SCTE's national headquarters at 669 Exton Commons, Exton, Pa. 19341, or telephone (215) 363-6888.

Election packages mailed to members

SCTE election packages were recently mailed to all active national members. The packages contain voting information on candidates for the eight open board of directors positions, as well as information on a referendum vote to change the Society's bylaws.

All national members will have the opportunity to elect one at-large director to the board, while members in seven SCTE regions will be voting for directors to represent their areas. The election package will include biographies of all candidates to assist members in the voting process.

The Nominations Subcommittee has submitted the following names to SCTE Secretary Jim Farmer to placed on the 1992 ballot:

- At-large: Tom Elliot (incumbent) and Pete Petrovich
- Region 3: Norrie Bush, Eugene Fry and Sally Kinsman
- Region 4: Bill Arnold and Wayne Hall
- Region 5: Don Gall, John Grothendick and Mark Wilson
- Region 7: Terry Bush and Dan McKay
- Region 8: Don Shackelford and Jack Trower (incumbent)
- Region 10: Michael Smith (incumbent) and Scott Weber
- Region 12: Walt Ciciora (incumbent) and Robert Price

In addition to these candidates, members will have the opportunity to vote for a person of their own choice through an additional line that will be provided on the ballot for "write-in" votes for each open position.

The referendum, which the board of director's majority recommended be submitted to the Society's membership for a vote, deals with proposed changes in the titles of the Society's leadership. Under this change, the titles of president and vice president would be utilized by the Society's national staff, while what are currently

the board president and vice presidents would become recognized as chairman and vice chairmen.

Please be sure to read the voting instructions and biographies carefully before making final selections. Election packages should arrive to members in early this month, and completed ballots must be postmarked by March 15. Please exercise your ability to direct the future of your Society and vote. If you are an active member and do not receive a package, please contact SCTE national headquarters at (215) 363-6888.

The year in review: Scholarship Subcommittee

(Submitted by Leslie Ellis, Member, SCTE Scholarship Subcommittee)

Twenty-eight SCTE members are smarter about their jobs this year, thanks in part to the SCTE Scholarship Fund. In all, the scholarship program has distributed in excess of $12,000 in educational assistance this year. And the pot isn't empty; more than $25,000 lays waiting to be tapped.

Some scholarship recipients used the money toward National Cable Television Institute courses; other opted to take engineering classes at local votech colleges and universities. Still others used the grant to pay for textbooks.

Scholarship recipients are nothing short of ecstatic when they discuss the available educational funds. Case in point is Julie Hollon, a staff engineer for TeleMedia in Richmond, Va.

Hollon, who is finishing up her last year in a four-year E.E. degree at Virginia State University, can't speak highly enough about the Society's involvement in her education. "The scholarship was a godsend to me," she recounts. "My future in this industry is strictly contingent upon the quality of my education. So I am ecstatic and forever thankful. And every dollar SCTE has provided me with will be returned to the industry tenfold.

"I have the ambition and the capability. And I'll have the education, too," Hollon continues. "This industry needs trained people. There are so many technicians out there who don't even know what a frequency is. Everything they know they've learned on the job. But the days of the shade-tree mechanic are going by the wayside."

Hollon, who aspires to be a cable CEO someday, saw the application for an SCTE scholarship two years ago in a trade publication, and sent it in. She has been receiving financial aid from SCTE ever since.

The following active members have received financial assistance this year from the SCTE Scholarship Program: Jeff Green, Larry Thompson, Mark Ulrich, Ken Gabehart, Ronald Kistner, Tom Maloney, Bernard Doffing, Mike Pieson, Paul Workman, Tim Romig, John Zepnick, Cliff Anderson, Sean Dalton, William Purcell, Jack Villa Jr., Robert Young, James Melder, Randy Miller, Howard Sudberry, Jeff Green, Julie Hollon, Jeff Howcroft, Jim Toth, Mark Bosteder, Chris Early, Mike Giobbe and Walter Gerber.

There are plenty of reasons to delay education. No time. Too many other commitments. Low placement on the priority list. But one thing is clear: Lack of available cash doesn't have to be one of those reasons, particularly not for active SCTE members interested in furthering their careers through higher education.

To apply to the Scholarship Program, pick up an application at your next local SCTE chapter or meeting group session, or call national headquarters at (215) 363-6888.

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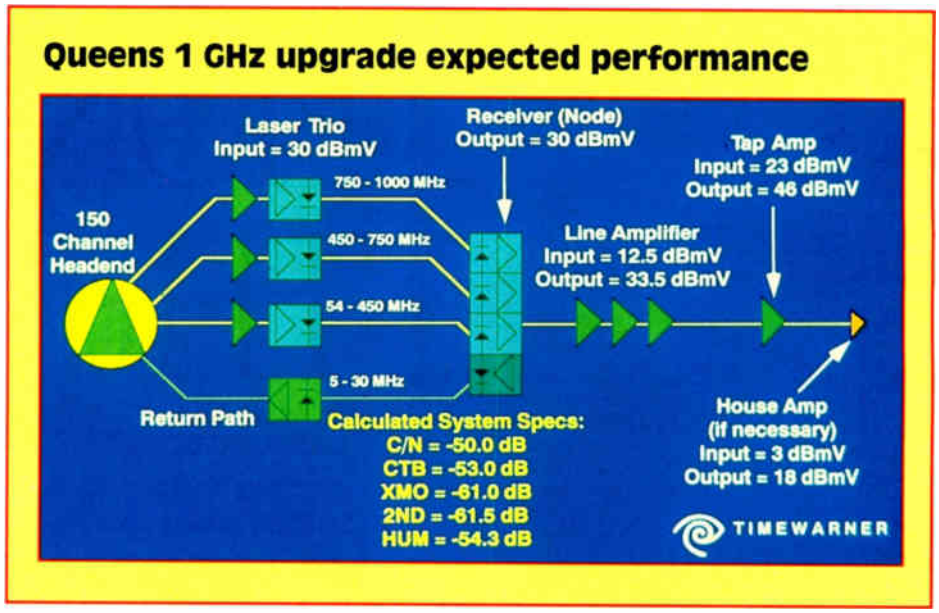
Reader Service Number 19

The Queens' gig: Details of the 1 GHz upgrade

Each of us reading this publication is acutely aware that the cable systems we have been putting in place over the past few decades have a much greater value today beyond our current business of delivering TV entertainment signals. As fiber-optic technologies improve and new technologies such as digital video compression, personal communication networks (PCNs), high definition TV (HDTV), and the electronic program guide emerge, the CATV system evolves into the cable communications network and a host of new business opportunities become evident.

This article focuses on one of the first steps toward realizing the full potential of the cable network — the 1 GHz upgrade in Queens, N.Y. The equipment/architecture combination devised provides the capability and flexibility that supports all of the previously mentioned technologies in its current form by the addition of the new terminal equipment.

By James P. Ludington
Project Director-Advanced Cable Systems
Time Warner Cable



The Time Warner Queens system is a recently completed 550 MHz system that supports a full 78-channel lineup including three channels of impulse pay-per-view (IPPV) and a number of ethnic pay services in languages such as Chinese and Hindu. So why choose a state-of-the-art system for this upgrade? The answer lies in the benefits realized by expanding the capacity of the cable system. Three benefits of expanded capacity are:

1) Choice
2) Alternatives
3) Diversity

Let's look at each factor in detail.

Choice. The core business of the cable system is to provide entertainment choices to subscribers. It is evident by the success of the video rental industry, the continuing rally to reregulate the cable industry and the ever-present home satellite delivery systems that cable operators have not been totally successful at the task of providing enough choice to satisfy all subs.

A high-capacity system allows the use of a large number of channels to be devoted to the repetitive scheduling of any number of movie titles or events allowing the subscriber to choose what to watch as well as the convenience in when to watch it. Dubbed near video-on-demand (NVOD), the Queens system will initially assign 57 channels of the new 150-channel system to this type of PPV programming.

So, why Queens? In order to properly measure incremental gains in PPV buy rates and revenues, this new method of offering TV entertainment had to be launched in an area with subscribers already familiar with IPPV. Time Warner Home Theater in Queens is a successful four-channel PPV operation, thus Queens is the logical location for studying the implementation of so much more IPPV. Additional "niche" programming services also are expected to emerge considering the success of the current ethnic services.

Alternatives. The 1 GHz architecture in Queens creates a large number of coaxial cable service areas fed by individual "home run" optical fiber links from the headend. Each of these nodes serves an average of four to six miles of horizontal plant, or a large multiple dwelling unit (MDU) complex (vertical plant), with an average of 1,500 passings per mile. Each is a network that is ideally suited to provide all types of telecommunications, interactive services and data services.

Diversity. The standard video channel capacity of 1 GHz is approximately 155 channels (though the entire spectrum does not have to be dedicated to 6 MHz NTSC channels). Diversity enters into the equation when digital compression becomes practical. This high-capacity system can be divided into analog and digital portions and carry both signals simultaneously. Now a path is cleared for both existing NTSC fare and any number of two-

(Continued on page 70)

The invisible crime of stealing cable TV

By Mike Mayberry
Construction Coordinator, Continental Cablevision

When is stealing not really stealing? What crime is considered victimless? What crime has laws forbidding it that are seldom enforced against the perpetrator? If you answered "theft of cable service" you were correct. You don't win anything. You just recognize the problem — and it's a big problem.

Lack of cooperation and apathy by honest people is part of the problem. The laws are specific, the enforcement is not. Our business — cable TV — pays its employees wages. Honest customers pay cable companies for a service. The thief steals twice. He steals the product from the company and wages out of your pocket. (Based on the National Cable Television's cable piracy survey conducted in 1990, the industry lost an estimated $3 billion in unrealized revenue due to theft of cable service.) Sooner or later some of the budgeted money for cable expenses has to be diverted to cover the costs of cable theft.

Both employees and customers can become involved in spotting the illegal user of our service. These people should share in the reward. Stealing our product, in whatever form, is no less a crime than robbing an individual's house. If you tap into our service, take a converter, add a movie channel, or add an additional outlet — all are stealing.

How long before the legitimate customer says "enough is enough"? The Federal Communications Commission makes the theft of cable a federal crime. However, on the local level, it is treated as a misdemeanor. Maybe cable companies, local police, the courts and the utility companies should sit down together and hammer out a final solution. Climbing a pole to hook up an illegal service is a crime against the utility companies. Manipulating CATV equipment is certainly a crime. After all, aren't we as a cable company doing a disservice to the honest customer if we do not demand enforcement of the laws and punishment for the thief?

For too long, stealing cable has been the invisible crime. But the fact is, thieves are what these people are and a crime is what this is all about. We should treat this problem for what it is or give our product away for free. It can no longer be ignored or put aside for now, even if only a small percentage of the population steal our product.

War against theft

Currently, due to inadequate laws, lack of enforcement, or just plain apathy on our part, we ignore it. It's the "it's more trouble than it's worth" syndrome. When that small percentage that steals cable becomes increasingly larger, when the minority becomes the majority, will it be too late to reverse the problem? This problem is really a battle — a war — and if we lose can we be sure we will get a second chance? If ever there was a time for escalating a war, the time is now.

A stalemate is unacceptable. Spell out every rule and regulation for stealing cable services once and for all. Make it strong. Make it plain and understandable. And most of all, make it hurt the criminal. Cable theft must be prosecuted and fines imposed. It doesn't matter if the fine is only $100. The punishment must be visible and lasting. Jail sentences, even if only for 48 hours, should be imposed. Thieves must lose something of greater value than that of the product they have stolen.

Perhaps the lack of anonymity is the greatest punishment of all. People need to understand that cable theft is a crime. It doesn't matter if it is just one pay channel or just a converter that is stolen. It is still stealing. If the thief does not suffer any consequences or if the punishment is not sufficient, then the real loser is the cable company and we have no right to complain.

Stealing cable is considered a recreational crime. But can a cable company afford to continue to do business with a thief on the payroll? He may not be an employee of the company, but without sufficient punishment to serve as a deterrent, the company may as well budget for the expense.

What we can do

The livelihood of every cable employee is at stake. Look at it this way: If wages cannot be raised because cable operators are paying for theft of service, then the thief not only steals from the cable company, but also from us as employees. Let's make this crime visible. Let's charge for service calls that turn out to be illegal connections. Let's inform these criminals that this crime will not be seen as business as usual and will not be tolerated. If damages occur while the thief is making an illegal connection (e.g., a broken apartment box or a damaged pedestal), let's fine them and require a mandatory jail sentence.

At a minimum, cable theft is vandalism. The thief needs to pay the price for cable theft, not the honest customer, the cable operator or its employees. If this trend of apathy toward cable theft continues, the only people who will be able to afford to have it will be those who steal it. **CT**

TDRs can assist in theft prosecutions

The following is adapted from a submission that ran in the NCTA Office of Cable Signal Theft's publication, "The 1990 'Signal Security Ideas Competition' Collection of Entries." The fifth annual competition is currently underway. For more information, contact the OCST at (202) 775-3684.

By Henry E. Hack
Corporate Manager of Investigations and Field Audit
Cablevision Systems Corp.

Prosecutors in different jurisdictions demand different standards of evidence in order for them to bring a prosecution for theft of cable service. The type of cable theft we most frequently encounter is the residential subscriber who has reconnected himself at the tap after being disconnected for non-pay or other reasons. Less frequently we find a "never" subscriber who has run his own drop to the tap or who has split off the service of a neighboring legal subscriber.

Our standard procedure is to disconnect the illegal connection and send the resident a certified letter stating that we have disconnected the cable connection between his residence and our cable system. The applicable state law governing theft of service is mentioned and the resident is given the telephone number of customer service to call if they desire to become a paying subscriber.

All illegal disconnects are monitored and if the resident reconnects a second time, a criminal prosecution for theft of service is commenced. The evidence given to the prosecutor is:

1) Written deposition of the audit technician who did the first disconnect of the illegal connection.

2) The connection itself. (The fitting and 3-4 inches of cable are retained with the paperwork.)

3) A copy of the certified letter sent to the resident with the "return receipt" card.

4) A photograph of the second illegal connection showing the drop from the tap to the residence.

5) Statements of the arresting police officers of their arrest. (Illegal connection observed, TV set observed tuned to cable station, resident's admissions, etc.)

Getting a conviction

In most cases these evidential items are sufficient for a prosecutor to not only make a "prima facie" case, but to also obtain a conviction for theft of service. However, we live in a diverse nation and some prosecutors demand more in the way of evidence. A district attorney in one of our Midwest systems informed our security manager that he would not undertake a prosecution unless he was provided with a videotape of the suspect climbing the pole and reconnecting the cable himself. Although this is an extreme example, we must always be prepared to offer the best documentary evidence available in order to make our case attractive as a "winner" for the prosecutor. In the state of New York there is a presumption in the theft of service statute that an illegal connection is presumed to have been made by the resident. Even with this presumption, some local prosecutors demand more. They ask such questions as:

- "How do you know that the suspect was actually watching your cable signal?"
- "How do you know what the cable end in the house was hooked up to?"

One way to answer these questions is the method of arrest as indicated in Item 5 in the previous list. When the arresting officer gains entrance to the home (we go to the home shortly after the dinner hour) he usually observes the TV set on. A signal to the audit technician to cut the illegal connection at the tap allows the police officer to observe the set go to "snow-no-sound" if it is attached to the system.

Using the TDR

But suppose the resident refuses entrance to the home, as they can legally do, in the absence of a warrant? The answer may very well be found by employing a time domain reflectometer (TDR). Most line maintenance/service departments of cable companies already possess a TDR. Its chief function is to detect a fault in a cable run (short, open, crimp, water condition) and to pinpoint its exact location. The TDR sends an electrical pulse down the cable that is reflected back from the fault location and displayed on the CRT. The distance from the TDR to the fault also is displayed so the technician can more easily locate and repair the fault.

The TDR has now found practical use over the past few years in detecting illegal splits and cable connections. The newer models are portable, battery-operated and provide an immediate printout of the condition observed on the CRT. Some manufacturers are specifically advertising TDRs with reference to their value in detecting illegal connections. The printout of the graph made by an illegal connection is very strong evidence of cable theft and should convince all but the most adamant prosecutors that the suspect is illegally watching the cable signal.

The practical method of using the TDR is to build an atlas of printouts of various connections at the end of a cable and use it as a "standard reference" to compare printouts obtained from illegal connections. The printout of the illegal connection is obtained by disconnecting the illegal connection at the tap or groundblock and connecting the cable to the fitting on the TDR. After the printout is obtained, the illegal connection is reconnected and the printout retained as evidence.

The atlas of printouts should include, but not be limited to:

1) An open cable.
2) A shorted cable.
3) A cable connected to a VCR.
4) A cable connected to a converter. (A separate chart should be kept for each converter used by your company and as many others as possible from neighboring companies.)
5) A splitter with various devices connected to its legs (converters, TV set, VCR, transformer, etc.)
6) A cable-compatible TV.
7) A TV set with matching transformer.
8) A matching transformer with output leads shorted.
9) A matching transformer with output leads open.
10) A barrel.
11) Two-way, three-way, four-way splitters and splitter/amplifier combinations.

The TDR can be a valuable aid in substantiating a connection to a cable system and thus aiding the prosecution of a theft of service case. It also can definitively show that the end of the cable in a suspect's residence is not connected to a TV set (i.e., open or short) and will thus avoid the embarrassment of false accusations against an innocent person. **CT**

Developing a tap audit/ non-pay disconnect program

The following is adapted from a submission that ran in the NCTA Office of Cable Signal Theft's 1991 publication, "Fourth Annual Signal Security Ideas Competition." The fifth annual competition is currently underway. For more information, contact the OCST at (202) 775-3684.

By Robert C. Wagner
System Security Manager
And Bruce Snyder
System Security Supervisor
Cablevision of Chicago

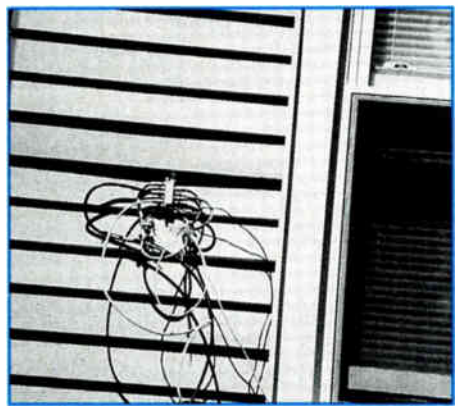
Cablevision of Chicago provides service to 31 suburban communities of Chicago, passing 192,000 homes with 71,000 active subscribers for a penetration of 37 percent, which is typical for the Chicago market. In 1987, the system established a system security department with a staff of four. Manpower has been increased each year and current staff is nine.

On many occasions over the years, audit operations were suspended to allow the security technicians to assist in reducing high pending installation pools. Although this was beneficial to the system as a whole, audit productivity suffered. This was especially true at times when sales and subsequent installations were high because these also were the best times for audit conversions to increase.

The department had to develop some type of method to maintain constant auditing throughout the year. Therefore, for 1990, the department proposed that it be given the responsibility of performing all non-pay disconnects with the allocation of two additional security technicians. The goal of the program would be to consolidate the non-pay disconnect and tap audit functions into a single, effective program that not only assured consistent audit and conversions but also saved non-pay accounts through improved bad debt collection and ensured that accounts that remained delinquent were actually disconnected.

How it works

With five security technicians now on staff, the system was broken down into five areas with each technician



Courtesy NCTA

MDUs are traditionally high in unauthorized connections.

permanently assigned to an area. The technicians were responsible for all non-pay disconnects and tap audit functions within their assigned areas. The idea was that each time a non-pay disconnect was performed at a multiple dwelling unit (MDU), the tech also would audit the MDU. Since MDUs are traditionally high in unauthorized connections, this method would enable the department to monitor them more closely. The security supervisor performed quality control of the techs and assisted in auditing problem MDU locations. With techs assigned to their own area, they became extremely familiar with them. This resulted in the techs identifying problem audit locations and repeated non-pay addresses, and overcoming access problems.

Since the techs were always working in their areas, several attempts could be made to make contact with non-pay subs to collect debts and save accounts. Often the non-pay subs asked for a few days to get the money together to pay the debts to which the techs agreed. Typically, a non-pay disconnect/MDU tap audit would be performed three days per week with straight auditing done on the remaining two days.

The department also strived to "bring back" those accounts that were not saved through debt collection. These accounts were assigned to the department's audit sales representative. Therefore, besides contacting tap audit disconnects, the rep also dealt with non-pay disconnects. In cooperation with the collections department, the audit sales rep arranged payment plans for those non-pay subscribers that eliminate their debts and come back on the system as paying subscribers. Usually, the payments involved one-half of the debt with the remaining half paid on their reconnection date. This proved to work well.

Also, in working with the non-pay accounts, the department identified many "professional" non-pay subscribers. That is, persons who subscribe, go non-pay and continuously resubscribe using fictitious names, phone numbers, etc. These accounts were made non-servicable in the data base and could only be sold with security's approval. The non-pay conversion rate increased steadily each month.

"Saving" accounts

In 1990, the department "saved" hundreds of accounts, collecting $35,838 in the field before disconnection. It disconnected 8,448 non-pay accounts. As with audit conversions, the department could only take credit for non-pay "conversions" if they occurred within three months after disconnection. A total of 1,481 disconnected non-pay accounts were brought back as paying subscribers with the collection of $99,863 in bad debts. These accounts resulted in an annualized recurring revenue of $620,243. In tap auditing, 24,850 homes were passed with 2,657 unauthorized connections removed from the system. A total of 983 of these accounts were converted into paying subscribers for an annualized figure of $411,680.

Therefore, for the year, the system security department disconnected 11,105 bad debt and unauthorized accounts from the system. It converted 17.5 percent of the bad debt accounts and 40 percent of the unauthorized accounts into paying subscribers for a total of 2,464 active subscribers. Besides collecting $135,701 in bad debts, the department generated an annualized recurring revenue of $1,031,923. This type of program could prove to be successful for other systems, especially smaller ones that would like to perform a tap audit function, but do not wish to or cannot afford to make it a full-time program. **CT**

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Reader Service Number 21

Targeting new revenue with signal security

The following is adapted from a submission that ran in the NCTA Office of Cable Signal Theft's publication, "The 1988 'Signal Security Ideas Competition' Collection of Entries." The fifth annual competition is currently underway. For more information, contact the OCST at (202) 775-3684.

By Julia TeKippe
Manager of Audit
American Television and Communications

During the summer of 1986, the corporate audit department of American Television and Communications worked with seven divisions and performed extensive sample tap audits. The objective was to provide insight into the subject of signal security and unauthorized viewers (UVs). Perhaps the most significant finding from the project was that the majority of UVs were the result of our failure to do our jobs properly. Based on the significance of this finding, we decided to initiate two pilot programs to learn more about the in-house generation of UVs and to develop preventive measures to minimize it.

We perceive the UV situation as having two distinct parts. The issues are:

1) We need to stop creating additional UVs through non-performance or substandard performance of our duties.

2) We need to detect the UVs that exist in our systems and convert them to paying customers or disconnect their service.

Program highlights

Here are some of the highlights of the pilot programs (which we will cover in detail later) in Memphis, Tenn., and Charlotte, N.C.:

- The dedicated quality assurance (QA) technician in Memphis verifies an average of 40 service agreements per day.
- The QA technician in Memphis has never been pulled off QA work to fill in on connections or non-pay disconnects.
- The in-house and contractor accuracy rates for proper completion of tasks went from 75 to 93 percent within three months of implementing a QA program in Memphis and stayed in the 90s for the following year.
- The number of drop-related service calls decreased in relation to the number of customers in Memphis, which resulted in cost savings of approximately $20,000 in 1987.
- The accuracy rate of proper disconnects performed by the Charlotte connection group progressed from 50 to 80 percent.
- Charlotte experienced 30 percent conversion of UVs to paying customers simply by mailing letters to detected multiple dwelling unit UVs.
- $43,000 in additional annual revenue was gained in Charlotte from the conversion of 212 UVs to paying customers. This is still growing.

Don Shackelford, vice president of engineering, spearheaded the project in Memphis. A priority was established to stop creating UVs before we attempted to clean up our past mistakes. A full-time QA technician position was created with the initial goal to address the established priority. The position was staffed by Steve Gross, a current employee who had approximately three years experience in the connection department.

In Memphis, most connections were being performed by contractors while most other tasks were being performed by in-house personnel. It was decided all contractor and in-house work would be subject to QA reviews.

The QA review includes verification of appropriate service level along with verifying compliance with the Memphis division's technical specifications. The quality of the connections will have a significant impact on the number of service calls we perform in the future.

"Perhaps the most significant finding from the project was that the majority of unauthorized viewers were the result of our failure to do our jobs properly."

The first few weeks Gross did QA reviews, the accuracy rate was approximately 75 percent for both in-house and contractor work. It was a shock to everyone that work habits were this poor.

Raising accuracy awareness

The next objective was to raise the accuracy rate. Employee and contractor awareness of the division's commitment to doing the job right the first time became the emphasis of the project. Some of the methods used to communicate the division's commitment to the employees and contractors were:

- Articles in the employee newsletter and spots on the in-house payday video show about the program.
- The president talked to new installers during their two-week training class and stressed the importance of the program and doing their job right the first time.
- In-house employees had to personally do corrections for deficiencies found in their work.
- Contractors were not paid for jobs not completed satisfactorily in addition to having to correct the deficiencies.
- Positive feedback was provided by Gross when work was good; Shackelford also sent congratulatory letters to top performers.
- The termination of two employees during the first month of the program resulting from non-performance of disconnects.

The accuracy benefits

The communication and commitment have paid off. The in-house and contractor accuracy rates went from around 75 to approximately 93 percent in three months. It is especially rewarding that these rates stayed in the 90s in the following year.

Gross never was pulled off QA work to fill in on connections or non-pay disconnects, as mentioned previously. As minor as this point may seem, it is in extreme contrast to what happens at most other locations. Everyone has good intentions to do QA reviews, but the designated employees are assigned other tasks and QA slips through the cracks more often than not.

To quantify the project: the full-time

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Reader Service Number 22

QA technician position costs approximately $24,000 per year including wages, benefits, vehicles and other related costs. This is essentially the only direct cost of the project.

The benefits are more difficult to quantify but do, in fact, outweigh the cost. Contract labor payments represent an easily quantifiable benefit. The Memphis division deducted $2,500 from contractor invoices for jobs completed improperly in the first year of the program.

The most significant benefit identified to date is the reduction of the number of drop-related service calls. In 1987, service calls declined by more than 2,200 representing a savings of more than $20,000. We believe the full benefit of the program will be realized down the road. Sloppy work does not always result in immediate service calls.

Another future benefit was in the number of disconnected-in-error service calls. The division spends over $30,000 a year on disconnected-in-error service calls. It was deduced that once the program had been in place for a longer period of time and more of the drops are tagged, this type of error will be less likely to happen.

Gross reviewed an average of 40 jobs per day. This represents approximately 5 percent of the work completed in the division. He was able to cover so many jobs by being very organized and due to his familiarity with the system. Since he had been with the division for several years, he was very efficient at selecting and routing the service agreements so that driving time was kept to a minimum each day. In addition, he did not climb poles very often because you can generally see the quality of overall work from the ground.

The Memphis division planned on expanding its tap audit department soon after the program's inception. Efforts at first though were concentrated on following up on customer and employee referrals regarding UVs, researching the canceled connection report and working in conjunction with sales representatives on audit/conversion blitzes of MDUs. The division has been successful in prosecuting some repeat offenders and has had favorable media publicity about the prosecutions and its QA and tap audit programs. As the program developed, the division also made plans to do more systematic tap audits with conversion efforts to identify and clean up all existing UVs. The potential for increased revenue was waiting to be tapped!

Alan Spencer, vice president of finance, had responsibility for the development of a QA program at the Charlotte division. A QA supervisor position was created and staffed by Mike Ferguson, who had a few years experience at Cablevision of Charlotte as a customer service representative. Administratively, Ferguson reported to, and was assisted by, Nancy Morris. She is the director of internal control with responsibility for QA among other duties. A decision was made at the beginning of the project to separate the QA function from connections and technical services in order to provide objectivity and segregation of duties. This was helpful as several employee terminations for improper work performance resulted.

Focus on disconnects

From the beginning, the emphasis of the Charlotte program has been on ensuring the proper completion of assigned disconnects by ATC personnel. Proper and accurate completion includes adherence to established

REVOLUTIONIZING TELEVISION AUTOMATION

Controlling multiple headend switching functions

By Patrick L. Bates
Customer Service Manager
And **John Gerstenberg**
Applications Engineer

Situation

A west coast MSO presented us with the task of automating multiple switching functions at the headend. Two cable networks were running cross channel promotions; another broadcast network often required switching between local and remote feeds; and additional switching control was needed to feed a wide variety of programming sources into the system's local origination channel.

Objective

To provide the Headend Engineer with a single system that would accomplish all of his current switching requirements, as well as expand to meet future demands.

Solution

We designed a custom automation system around our state-of-the-art Programmable Clock Unit, the PCU-1A. The PCU-1A provides a variety of real-time headend automation control functions, including audio/video and cross promotion switching, local origination program playback, IF/RF switching relay closures, and VCR control.

Advanced clock control

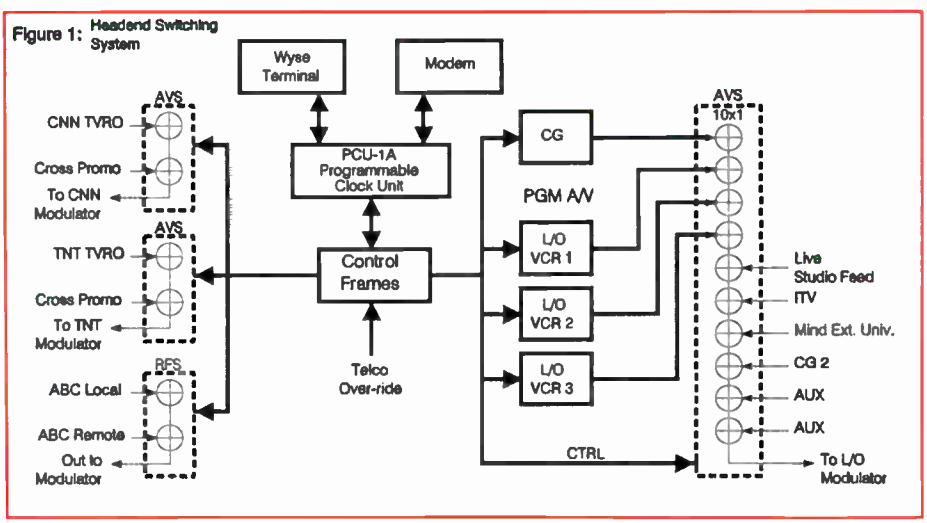
With a 3,000 event storage capacity (each event may contain up to eight separate functions), the PCU-1A has the ability to store and execute 16 separate 24-hour schedules. As illustrated in Figure 1, the PCU-1A interfaces with a Wyse terminal (or IBM-compatible PC) for full screen system control, status monitoring and easy scheduling. An automatic schedule template generator helps create schedules quickly, and a printer can be used to generate hardcopy verification of events. A dial-up telephone modem provides optional manual override.

Custom control

To execute its scheduled events, the PCU-1A communicates with several different switching devices through a BInary to Decimal Decoder (BDD). The BDD receives the PCU's four bit TTL binary input and produces 10 discreet outputs. In the right configuration, these BDD's can produce up to 1,000 discreet outputs for virtually unlimited switching control.

Two vertical interval Stereo A/V Switches (AVS-3021A) were employed to handle cross promotion switching between two cable networks, CNN and TNT. Each switch accepts two inputs of stereo audio and video, and routes selected input to the output bus. Its total solid-state design ensures that vertical interval switching occurs automatically with synchronized inputs to provide smooth transitions.

Figure 1: Headend Switching System



For switching between local and remote feeds on the ABC affiliate channel, we used our A/B IF/RF Switch circuit (RFS-3001A), This solid state, shielded (Single Pole Double Throw) switch provides remote switching of low-level IF or RF signals, with better than 70 dB isolation between inputs at 100 MHz, less than 1 dB insertion loss, and a frequency range of 20 to 500 MHz.

Since the system's LO channel draws from several very different programming sources, including CG's, multiple VCR's, live studio feeds and cable satellite networks, we installed an AVS-10AS Patchmaster™ 10-input by 1- output switcher to do the job. This bridging audio-follow-video, stereo routing switcher features high impedance, low capacitance bridging inputs, and performs vertical interval switching.

Remote control

For added convenience, we included a custom control frame in the system configuration that allows a technician to control the switching of any crosspoint simply by calling from a standard touchtone phone. The frame contains assorted modules from Channelmatic's 3000-series, including an Unattended Telephone Answering Device and a DTMF Tone Decoder.

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standards and procedures in addition to the actual performance of the disconnection. The program commenced in January 1987, with approximately two months dedicated to establishing the goals and objectives of the program and educating the field staff about the program. An element of the educational process was to videotape identified improper disconnects to illustrate the right and wrong ways to perform a disconnect.

Initial verification of disconnects performed by the ATC connection group identified accuracy rates as low as 50 percent. However, as the educational process continued and proper methods were better communicated to those actually performing the disconnect, accuracy rates regularly and consistently increased. A 90 percent accuracy rate became the norm as opposed to the exception.

During the summer of 1987, disconnections performed by salespersons were added to the review process. Although not as dramatic as the improvement noted in the connection group, the accuracy rate for this group improved from less than 50 percent to an average running rate around 80 percent.

Audits of apartment passings proved to be revenue producers at a relatively low cost. During a four-month period, 2,900 apartment passings were audited resulting in the identification of 705 UVs. Of the 705, 212 soon became paying customers resulting in $43,000 of additional revenue. The conversion from UV to paying customer primarily resulted from the sending of a letter notifying the resident of the unauthorized service and pending disconnect unless a request to be put on billing was received.

"$43,000 in additional revenue was gained ... from the conversion of 212 unauthorized viewers to paying customers."

Going forward, two additional employees became a part of Charlotte's QA program to help address several new agenda items. Included on that agenda were the verification of connections, QA reviews of completed construction work, following up on "illegal leads" provided from customer service and field personnel, and the pursuit of repetitive, unauthorized connections through the court system.

The presence of an ongoing QA function became even more important when the Charlotte system descrambled its tier service in early 1988. With the most popular premium services being trapped, the need for continued and expanded efforts at identifying UVs became imperative.

Signal security benefits

To conclude, I'd like to go to the opening paragraph of our *Signal Security: Targeting New Revenue* report: "Annually, ATC is supplying $110 million of free cable service to UVs. A 30 percent conversion rate of UVs would provide ATC with an additional $18 million of net income each year. The related lift would result in 82,000 basic customers and 88,000 premium units."

Implementation of a signal security program and the associated benefits are a long-term proposal. The two pilot programs, although very much a success, did not really specifically and initially address the conversion issue. We have been successful in minimizing the creation of new UVs. The task of identifying and converting existing UVs to paying customers became the logical next step after this.

A division must be willing to invest resources up front for little return in the short term. This up-front investment will pay off through increased revenue and/or decreased costs in future years as well as through benefits we now describe as intangibles. Such intangibles appear to include the following:

- Improved company image to paying customers and the community at large.
- Improved picture quality due to reduced signal leakage.
- Increased self-esteem and motivation of employees.

Dean Deyo, Memphis division president, summarized his impressions soon after the inception of the pilot program by saying, "I guess we always knew that an audit program like this was something that we should have been doing. But when you're fighting a lot of other fires you tend to let it slip. I have seen many direct and indirect benefits. I know that our biggest gains from the program are more long-term and are still ahead. If I had it to do all over again, I would have this program in place from day one. Life would be much easier today if we had." **CT**

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Reader Service Number 26

The Queens' gig

(Continued from page 25)

way, high-speed digital signals including compressed digital video and HDTV.

The Queens 1 GHz architecture

As noted, this project is an upgrade from 550 MHz to 1,000 MHz. Queens is currently a conventional single trunk "tree-and-branch" architecture, with FM fiber used to interconnect multiple headends. In an upgrade, major criteria includes the reuse of as much of the existing plant as possible, an improvement in system performance and reliability, and an increase in channel capacity.

The fiber architecture uses 1,300 nm laser technology and combines three downstream fibers, one return fiber, and two future-use fibers dedicated to each node. The channel distribution of each downstream fiber is 60 in the low-band, 50 in the mid-band, and 40 in the high-band. This approach was the result of the combination of expected equipment performance, fiber costs and desired system performance. Path redundancy and the desire to limit the amount of fiber in any particular cable were considered when a maximum count of 96 fibers per cable was established. The system architecture and calculated system performance is depicted in the figure on page 25.

The coaxial portion of the architecture is a fiber-to-the-feeder approach combined with super-distribution cables. Almost 100 percent of the existing strand and coaxial cable is reused in the new design and approximately 30 percent of additional cable is necessary to supplement the new design. Much of this cable is placed to extend the express cable past the existing trunk layer.

This design called for no more than four amplifiers in cascade; a maximum of three "line" amplifiers and one "tap" amplifier. The line amp is a unit with one low-level output (31/23 dBmV) feeding the next line amp via the express cable, one high output port (43/33 dBmV) feeding the distribution system, and contains automatic gain control (AGC) circuitry. The tap amp is a dual high-output (43/33 dBmV) distribution device without AGC. It feeds only distribution plant and does not pass power since there are no actives past this point. Therefore, it is not necessary for the taps to pass power,

improving the insertion loss characteristic and eliminating a persistent point of outage.

The design tap output level is a minimum of 16 dBmV. Using RG-59 drop cable in this example, an average input to the converter is as follows:

Minimum tap output = 16 dBmV
Loss per average drop = 8 dBmV*
Two-way splitter loss at 1 GHz = 4.5 dBmV
3.5 dBmV into the converter
(*Cable attenuation per foot at 1 GHz = 0.8 dB; Average drop length = 100 feet)

Design tests show that 50 percent of the taps designed have an output of 18 dBmV or more and much of the existing drop cable is RG-6. This will have a positive impact on the previous example. All existing house splitters must be changed out at the time of converter upgrade and a house amplifier was developed for MDUs and structures with more critical signal requirements.

Converter and playback center

In order to provide an easy yet effective method of sorting out over 90 channels of programming and an additional 50 channels of PPV, a new subscriber terminal was developed. This terminal provides a menu-driven system that guides the subscriber through PPV choices, a personal messaging and announcement system, and converter functions.

"The current thrust of the project is to deliver PPV choice to the home, while projects regarding alternative business plans and digital video compression are around the corner."

The current thrust of the project is to deliver PPV choice to the home, while projects regarding alternative business plans and digital video compression are around the corner. For this reason, the terminal was designed with as much flexibility as was possible. Many of the terminal functions such as parental control, program timer and favorite channel list are resident in a removable, replaceable PROM circuit. Information regarding the schedule, rating, price and purchase of a PPV event (for instance) are all downloaded from the system controller via in-band data streams. The marketing approach to this new form of TV viewing is therefore fully flexible and adaptable to the perceived needs of the subscriber. How to successfully deliver this product into the home will not be an overnight process and the plan is to test a number of varying approaches.

To provide the source for the PPV programming, a high tech facility was constructed in the Flushing, N.Y., offices of Time Warner's Brooklyn-Queens Cable offices. Over 70 1/2-inch S-VHS videocassette players have been racked together and are controlled via an automation system. Once again, ultimate flexibility was planned. Room for expansion in floor space, rack space, control system and the signal router were designed into the playback facility. Each videocassette player's start, stop, rewind and cue is automatically controlled, the output of which is electronically routed to the proper audio or video encoder (with individuals in a master control area constantly monitoring performance).

At the outset, 50 channels are devoted to delivery of PPV programming, though this provides approximately 15 entertainment choices at any given time. To provide NVOD, four channels must be devoted to a single movie that is less than two hours in length in order for it to begin each half hour. If five two-hour movies are to be "multiplexed," this would consume at least 20 channels. Seven additional channels are planned for delivery of promotional and instructional video information. As was mentioned earlier, this plan is destined for refinement and the facility was designed with that in mind.

The 1 GHz technology also will be refined in the near future, though the plant that we have in place today is proven to be capable of handling the expanded capacity. As stated, the Queens project has given the industry another block by which to build an enduring business. The combination of all the blossoming technologies will be absolutely necessary for a successful future and each capital plant investment plan should be devised with the flexibility to take full advantage of each one. **CT**

Iridium: A high flying phone system

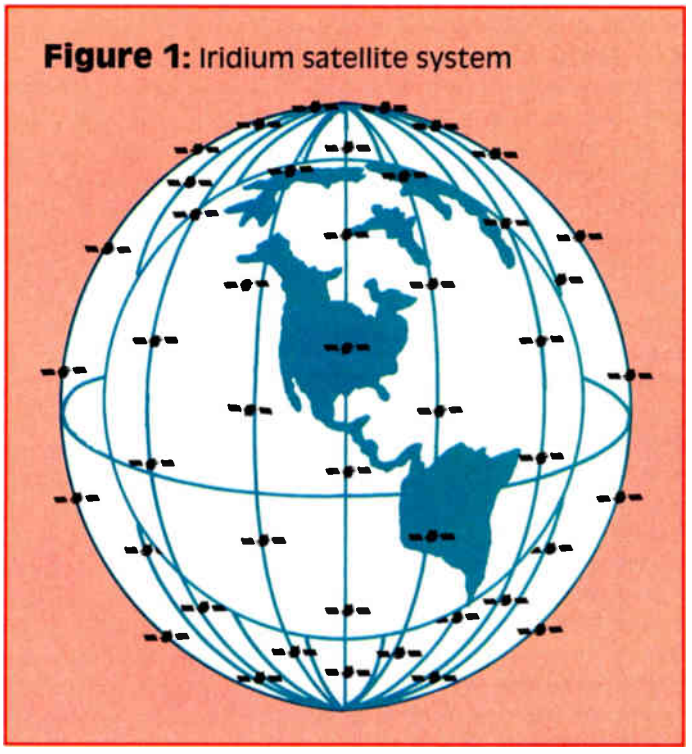
By Lawrence W. Lockwood
President, TeleResources
East Coast Correspondent

Motorola has proposed an intriguing worldwide phone communication system incorporating 77 low earth orbit (LEO) satellites. (Parenthetically the system's name is derived from the fact that the atomic number of the element Iridium is 77.) All the information on this system comes from Motorola sources including their detailed and massive December 1990 application to the Federal Communications Commission.

Satellite system

All users will need are hand-held mobile telephones or small transportable phone booths linked through a network of the LEO satellites to provide point-to-point communications between users located anywhere on Earth. Central to Iridium is the notion of the small satellite, sometimes called the light-sat (for light satellite), that could max out at 700 lbs. The concept of the light-sat is not new — more than 60 satellites lighter than 800 lbs have been built and flown by six countries since 1970. The Iridium satellites could be placed into orbit by a variety of existing launch vehicles (e.g., the U.S. Delta and Atlas, the European Ariane, the new U.S. Pegasus air-launched vehicle and others).

Since full global coverage is essential, in theory the best solution was to use a high earth orbit so fewer satellites could cover the globe. But the network had to connect with a hand-held telephone, which meant moving the orbit down but not so far down that the drag of Earth's atmosphere would lessen orbital lifetime. The satellites could not be near manned orbital space lanes nor could they be so far above them that they might be out of reach of a Pegasus launch capability. After extensive studies, the 77 satellites will be placed in seven planes of 11 satellites each in circular polar orbits (orbits going directly north or south around the Earth passing over the North and South Poles — see Figure 1) at an altitude of 413.5 nautical miles (nmi), or 476 miles.



A polar orbit is the one used by spy satellites because, since the Earth rotates underneath the orbit, a single satellite covers the entire surface of the Earth each 24 hours. It intuitively follows that 77 satellites in polar orbits would really blanket the Earth continuously. The satellites will all "travel in the same direction," which means the seven planes of satellites corotate toward the North Pole on one side of the Earth and come down toward the South Pole on the other side. The 11 satellites in each plane are evenly spaced around their planar orbit, with satellites in Planes 1, 3, 5 and 7 in phase with one another and those in Planes 2, 4 and 6 in phase with each other and halfway out of phase with 1, 3, 5 and 7. Each of the seven corotating planes is separated by slightly more than 27°.

The basic breakdown of the satellite weight would be 200 lbs for structure, 200 lbs for payload, 100 lbs for antennas and 200 lbs for enough fuel to last a five-year mission lifetime. Each satellite will have the capability of generating 37 antenna beams in the L-band (1,610 MHz).

"The Iridium system's digital cellular design is essentially a mirror image of present-day terrestrial cellular telephone systems."

Cell patterns

The Iridium system's digital cellular

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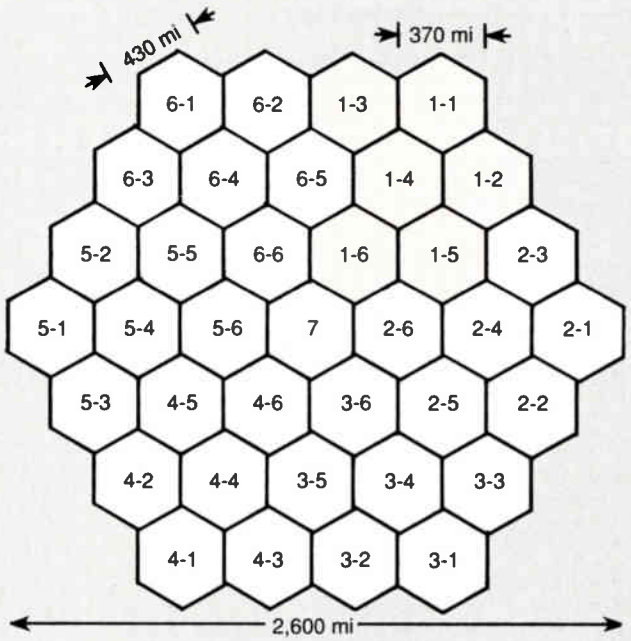
Reader Service Number 32

design is essentially a mirror image of present-day terrestrial cellular telephone systems (see my November 1991 column, "PCNs — TDMA or CDMA?"). The 37-cell pattern is fixed relative to each of the constellation's 77 satellites, but moves at 16,533 mph relative to the Earth's surface. As a subscriber unit is operated, handoffs occur from cell to cell (using a 7-cell frequency reuse pattern) similar to today's terrestrial cellular telephones. However, unlike the case of terrestrial cellular telephones, Iridium's cells would be moving across the user, rather than requiring the user to move through the cells. See Figure 2.

There must also be links from each satellite to others and also to earth-based telephone networks. This will be accomplished through constellation crosslinks (at 22 GHz) and gateway earth stations (20 GHz downlink, 30 GHz uplink) in various countries that would provide a link between the satellites and the public switched telephone networks (PSTNs).

The typical 373 nmi (430 mi) diameter cell can simultaneously service approximately 110 users (assuming the proposed 10.5 MHz of spectrum) while individual land-based cells can handle twice that number. Thus, Motorola claims that Iridium with its limited capacity and cost structure is not designed to compete with or replace existing landline and cellular systems. Instead Motorola says Iridium will target markets not currently served by mobile communication services, such as 1) sparsely populated locations where there is insufficient demand to justify constructing terrestrial telephone systems; 2) areas in many developing countries with no existing telephone service; and 3) small urban areas that do not now have a terrestrial mobile telecommunication structure. A graphic illustration of Iridium's worldwide coverage capabilities is shown in Figure 3.

Figure 2: The 37-cell pattern



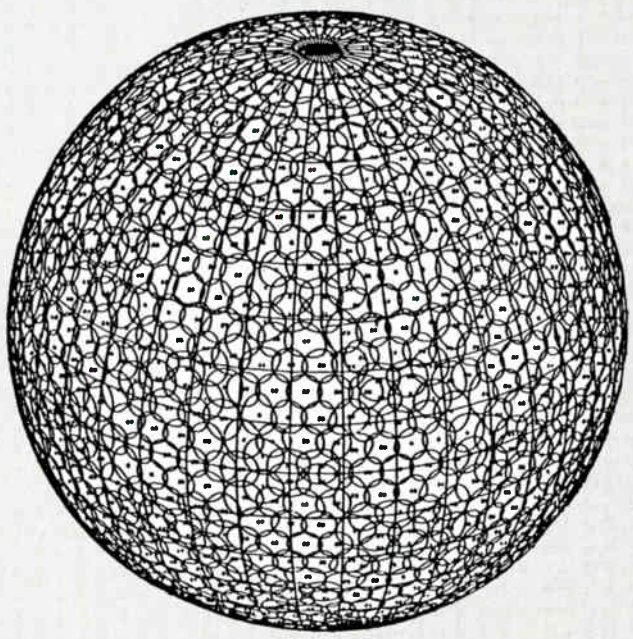
Current activities

Recently, Durrell Hillis (corporate vice president of Motorola and head of the Iridium program) announced that Lockheed Corp. (Calabass, Calif.) with a $l billion contract and British Aerospace (Berkshire, England) joined the design team and in the near future they expect to announce French and German participation in the program projected to cost $2.5 billion in 1991 dollars.

It is obvious that such a proposed system must have international participation. Present plans call for the Iridium constellation to be owned and operated by a consortium of international entities — such as major telecommunication companies and industrial concerns, postal telephone and telegraph (PTT) authorities and financial institutions — with expertise in telecommunications, influence of spectrum in a particular part of the world and the necessary financial resources. On the industrial team Hillis said that aside from Motorola "we think the French and Germans will be the final additions to Lockheed and British Aerospace."

Of the international owners and service providers Hillis said, "We anticipate somewhere between six and 10 major owners in the Iridium program, and we have other categories of ownership, including secondary positions and minority ownership for very nominal values."

Figure 3: Potential Iridium service areas



Operating costs and schedules

By its very nature, the Iridium system is a lower density, higher priced service than terrestrial cellular. Its per minute cost is estimated to be from three to 10 times that of conventional cellular setups. The project's financial analysis quoted a toll rate of $3 per minute for outgoing calls, which would be unaffected by distance, and a subscriber fee of $50 per month. Service costs will probably vary depending on the country and the time of day. Countries using the Iridium system as a public telephone service may choose to reduce the expense to the public through subsidies and special arrangements with the Iridium consortium such as through the leasing of bulk capacity and preleasing contracts. The worldwide total number of subscribers

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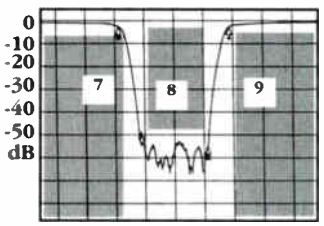
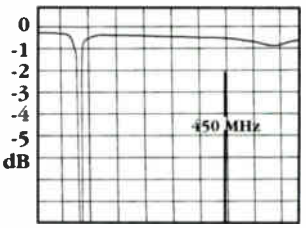
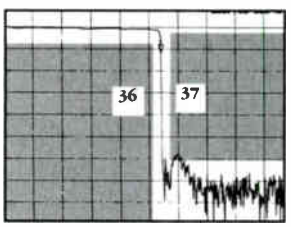


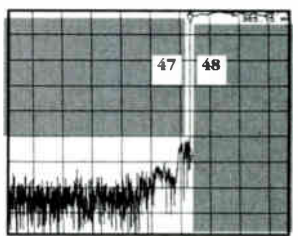
Single Channel 50 dB Notch, Leaves Adjacents In Service 3271ABH-8



Low Off Notch Attenuation To At Least 450 MHz Type3271ABH-8



Brickwall LPF 6211LP-36/37 Passes Channel 36 Down, 50 dB Channel 37 Up



Brickwall HPF 6211HP-47/48 Passes Channel 48 Up, 50 dB Channel 47 Down

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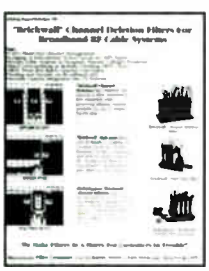

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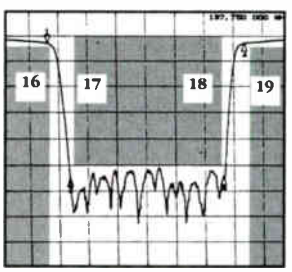
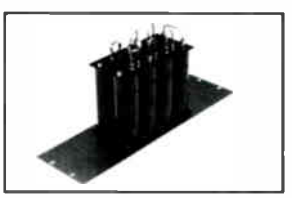
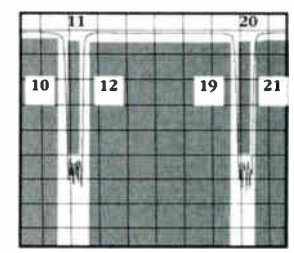


Contiguous Multichannel Type 7964-17/18



Single Channel Hyperband 3271ABY-FF



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is estimated to exceed 1.8 million in 2001 and 2.8 million in 2006.

Motorola gave a schedule of dates of the major anticipated milestones in the development of the Iridium system:

- 1991 — Consortium formation
- 1994 — First seven satellites launched, system control facility and four gateways operational
- 1996 — Early Iridium service available and full constellation deployed
- 1997 — The Iridium system and additional gateways are operational

Competition for Iridium

The road to system completion in a project of this scope inevitably acquires along the way a few bumps of opposition or competition. Before the World Administrative Radio Conference (WARC) '92 convenes in Torremolinos, Spain, U.S. officials are assessing concerns aired by Hughes Aircraft Co. about the Motorola plan for the Iridium frequency allocation that the State Department incorporated into its proposal. Hughes claims that the Iridium proposal is not an efficient use of the spectrum and that the frequencies requested by Motorola should not be allocated because traditional geostationary earth orbit (GEO) satellites can provide the same functionalities as Iridium without reallocating spectrum. So, in addition to its opposition, it appears that Hughes might like to be in the business itself.

A more likely and serious form of competition has recently been proposed by an international coalition — Inmarsat. The International Maritime Satellite Organization, a London-based consortium, is owned by 64 countries around the world including the United States, which is it largest stockholder. The Inmarsat proposal is called Project 21 and it would consist of about 35 LEO satellites used in *combination* with GEO satellites. Of course Inmarsat already has, and is launching more, GEO satellites to supply the position location service that it was formed to provide.

Inmarsat has estimated that Project 21 would cost between $500 million and $1 billion to put in place. Olaf Lundberg, Inmarsat's director general, has stated the "estimated potential mobile satellite markets, accumulated worldwide, will be significant enough by the year 2000 to support satellite investments in the neighborhood of $1 billion. But developments could stall unless significantly increased spectrum is allocated to mobile satellite services."

Conclusions

To predict the end of this scenario at this time is impossible. However, there is certainly one area that requires more information: that of the business finances — capital investments, operating costs and earnings. The wide difference of projected capital costs of Iridium ($2.5 billion) and Inmarsat ($500 million to $1 billion) is enough to give one pause.

As far as earnings are concerned, the services to be offered will be, by agreement of Iridium, Inmarsat et al, limited largely to undeveloped countries (communications internally and externally to and from developed countries). Thus a large portion of the earnings of an expensive system to create — and expensive to operate — must come from undeveloped countries.

Evidently, Motorola/Iridium and Inmarsat/Project 21 feel that they would profit from it. The best answer at this time seems to be "tempus omnia revelat" — time reveals all things. **CT**

February 1992

Antenna sites

BACK TO BASICS

The training and educational supplement to Communications Technology magazine.

Gen Saye

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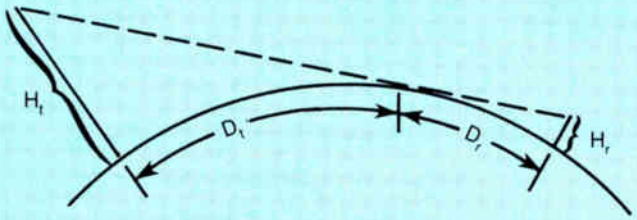
The problem of standby battery failures is tackled in this month's report by Performance Cable TV Products' Jud Williams.

Figure 1: Necessary tower heights



Total distance = $D_t + D_r = \sqrt{2H_t} + \sqrt{2H_r}$

Where:
D_t = transmitting antenna distance in miles
D_r = receiving antenna distance in miles
H_t = transmitting antenna height in feet
H_r = receiving antenna height in feet

For example, if H_t = 800 feet and H_r = 200 feet, then:

$$D_t + D_r = \sqrt{2 \times 800} + \sqrt{2 \times 200}$$
$$= \sqrt{1,600} + \sqrt{400}$$
$$= 40 + 20$$
$$= 60 \text{ miles}$$

Planning antenna sites and tower heights

By Nicholas Worth
Vice President, Engineering
And Larry Schutz
Staff Engineer
TeleCable Corp.

Equally as important as selection of proper antennas is selection of the optimum antenna site and tower height. As a first requirement, the ground elevation at the site must be sufficient to allow reception of the necessary TV signals with adequate strength. The prospective site must be zoned to permit the installation of a tower and must be located with respect to the service area so excessive trunk amplifier cascades are not required. The site also must be located far enough away from high voltage power lines to reduce the chances of electrical interference. Any large metallic structures nearby must be taken into account so ghosts may be avoided.

If you are attempting to receive distant TV stations (more than 75 or 80 miles from the headend) site elevation is very important. In general, the higher the elevation, the greater the received strength of distant signals. Of course, site elevation or tower height beyond that needed to receive adequately strong signals may expose the antennas to co-channel interference.

In large urban markets where off-air reception of distant TV stations is not necessary, strategic location with respect to amplifier cascade and avoidance of electrical interference and ghosts are of primary importance.

How high?

Once you've selected a prospective site satisfying all the previously mentioned requirements, you must select the proper tower height. Figure 1 shows how the necessary tower height varies with distance between the transmitting and receiving antenna for transmission over smooth earth.

In practice, satisfactory signals often can be received 10 to 20 miles beyond line of sight. Also, many broadcast transmitters have heights exceeding 800 feet, extending the distance at which signals can be satisfactorily received. Some suppliers of headend equipment offer computer-calculated predictions of signal strength for all TV channels. The cable operator must specify the geographic coordinates of the site and a range of trial tower heights.

Both of the preceding techniques are based upon the assumption that the earth between transmitter and receiver is smooth. If a ridge or mountain range exists between any transmitting site and the receiving site, you must plot profiles of terrain to estimate whether any additional loss may occur. One technique used to pinpoint required tower height in such cases is to hire a helicopter with pilot and use a signal level meter and test dipole antenna to measure the strength of all desired signals at various heights above ground.

For special cases, it may be necessary to hire an engineering consultant to help select the optimum combination of tower height and antenna facilities. If it's necessary to receive signals from a broadcast station too far from your cable system to permit high-quality signal reception at the headend, it may be necessary to build an antenna site closer to the broadcast transmitter and use microwave radios to transmit the signal back to the headend.

For microwave transmission, line of sight must exist between the microwave transmitting antenna at the remote antenna site and receiving antenna at the headend. That requirement plus the tendency of rainfall to attenuate signals in the 12.7 to 13.2 GHz band authorized by the Federal Communications Commission, limit the length of a typical microwave hop to 25 miles or less. If it's necessary to import signals from a greater distance, a microwave relay consisting of multiple hops must be established. Microwave antennas are paraboloids and have very high gain and extremely narrow beamwidth. FM microwave transmitters and receivers add virtually no degradation to pictures. Figure 2 on page 82 shows a block diagram of a microwave system.

Towers for antenna sites

The two types of towers used in cable TV for mounting antennas on are *guyed* and *self-supporting*. The type of tower selected for an antenna site will be influenced by the amount of land available and the required height.

If only a small amount of land is available, a self-supporting tower often will be the best choice because it uses a much smaller land area than a guyed tower. For example, an 110-foot self-supporting tower requires only 700 square feet of land; a guyed tower of the same height requires almost 31,000 square feet of land. However, the cost of a self-supporting tower increases dramatically with height, and above 120 feet a self-supporting tower becomes much more expensive than a guyed one. After

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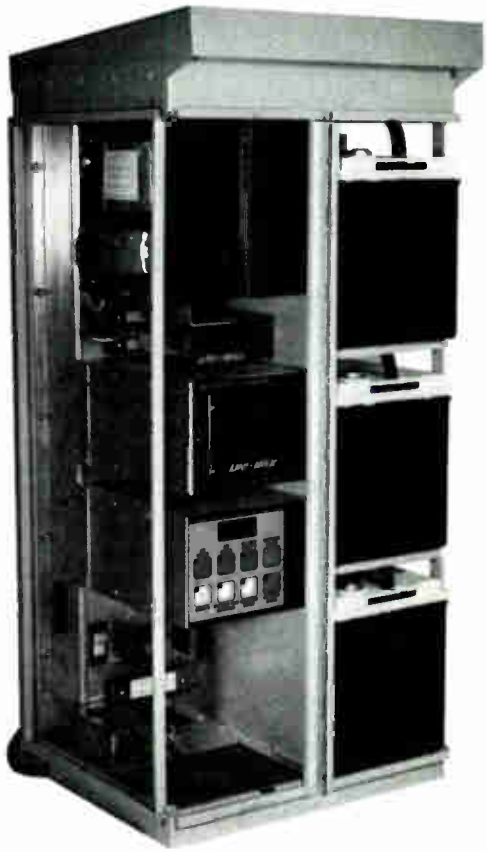

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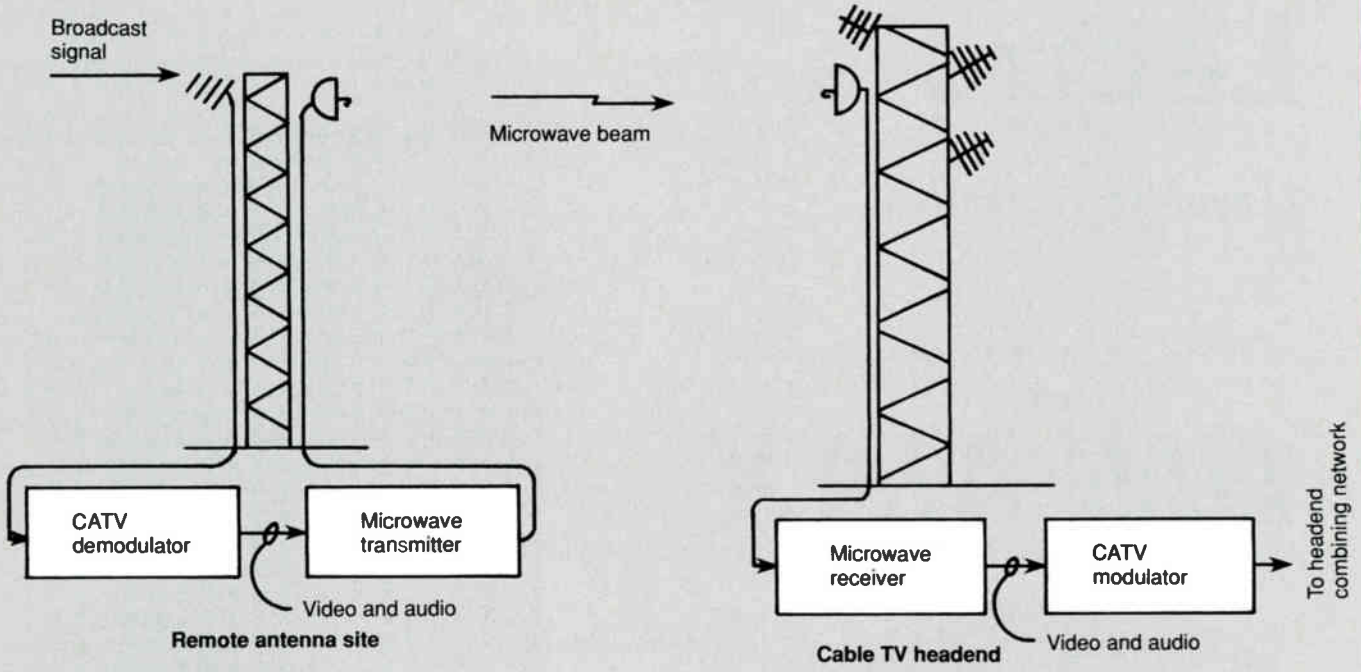
Figure 2: Microwave relay



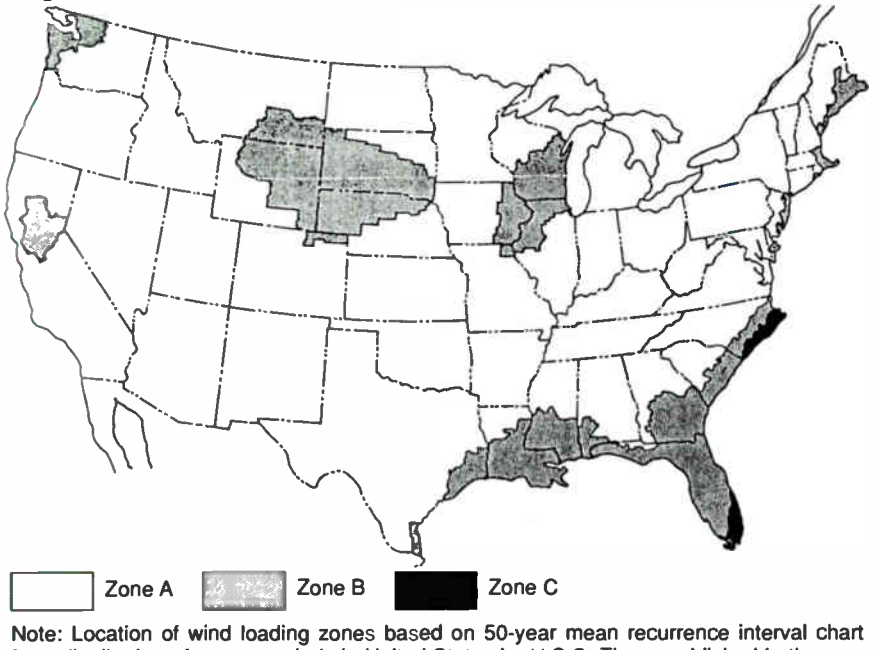
deciding upon the height and type of tower needed, the environmental factors and antenna loading must be specified so the tower manufacturer can design the proper tower for the proposed application.

Tower strength is specified by Electronic Industries Association (EIA) Standard RS-222-C "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures." This standard specifies (among other things) stresses, finish, foundation and anchors, guy loading, protective grounding, and wind loading pressure. EIA RS-222-C divides the country into three wind loading zones: A, B and C. (See Figure 3.) The minimum recommended wind loading pressure for each wind loading zone in the continental U.S. is as follows:

	Zone		
Height above ground	**A**	**B**	**C**
Tower portion under 300 ft.	30	40	50
Tower portion 300-650 ft.	35	48	60

(Note: Wind loading pressure is specified in pounds per square foot.)

Figure 3: Wind loading zones



Note: Location of wind loading zones based on 50-year mean recurrence interval chart from distribution of extreme winds in United States by H.C.S. Thom, published in the proceedings of the American Society of Civil Engineers, April 1960.

Ice loading is an additional consideration in specifying requirements for the tower manufacturer. Ice loading, the accumulation of ice on the surface area of the tower and its appurtenances, adds additional load to the tower in the form of dead weight and increased surface area exposed to wind. If the area in which you build the tower is subject to ice storms, you should require that typical ice conditions be taken into account by the tower manufacturer.

The location, orientation and description of all equipment to be mounted to the tower must be clearly communicated to the tower manufacturer, normally in the form of a detailed drawing. It is wise to provide capacity for addition of antennas in the future.

Microwave antennas, if used, place additional demands on tower design. Microwave antennas have a much narrower beamwidth than off-air antennas and require that the tower be equipped with "star mounts" near the antenna level to limit tower twist and sway.

The tower should be constructed of members that are hot-dip galvanized. Hot dip galvanizing, the immersion of tower

members into a "bath" of a hot zinc, is a method of coating both the external surfaces and the internal surfaces of the tower members. This method of galvanizing has proven to be effective in impeding corrosion. In addition to galvanizing tower members, all hardware installed on the tower should be made of stainless steel or anodized aluminum or should be galvanized to prevent corrosion.

Before the tower can be constructed, necessary permits must be obtained. In addition to local permits, the Federal Aviation Administration requires anyone who proposes to construct a tower 200 feet or greater in height or of lesser height but in proximity of an airport to file an FAA Form 7460-1 before construction. The FAA will determine whether the proposed tower will be a hazard to air traffic and whether it requires painting and lighting. The FAA has published a booklet titled, "Obstruction Marking and Lighting," Advisory Circular 70/7460-1G that describes the FAA's standards for painting and lighting of towers.

Installation

The following recommendations are based upon the experience garnered by TeleCable Corp. in approximately 30 headend installations in various regions of the country. For antenna downlead cables, use polyethylene jacketed aerial style, 1/2-inch cable. Always install the cable F-connectors and jumper cables on the ground, and weatherproof and test the splices prior to hoisting to assure mechanically sound connections. It's also a good practice to install a few spare downlead cables at the time of installation.

We normally require the tower installer to mount and assist in pointing of antennas. Use a signal level meter for basic antenna pointing, and a spectrum analyzer and TV set for nulling ghosts, co-channel signals or other interfering signals. Remember to carefully record signal levels and note any picture defects immediately after installation. (How else will you know if an installation has deteriorated? Also, it is particularly interesting to compare the measured signal levels with the computerized predictions of signal levels.)

The base and each leg of the tower should be grounded. As well, the ground rods should be tied together and to the headend building and power ground with copper wire of appropriate size. In areas with extreme lightning problems, install arrays of ground rods on the power company pole line leading to the headend and install a "well pipe" to serve as a tower ground. It also is advisable to ground the outer conductor of all antenna cables at the point of entry to the headend building.

The commercial power entering our headend buildings is conditioned by transformers and most headends are equipped with automatically starting AC generators. We further condition power to sensitive equipment with surge suppressors and spike filters. To protect vital computer equipment, you should install uninterruptible power supply units. Also, proper air-conditioning and cleanliness are essential to reliable headend operation. **BTB**

Sources

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2) Cunningham, John E., *Cable Television*, Howard W. Sams & Co. Inc., Indianapolis,1982.

3) Grant, William, *Cable Television*, Reston Publishing Co. Inc., Reston, Va., 1983.

4) *Engineering Considerations for Microwave Communications Systems*, Lenkurt Electric Co., San Carlos, Calif., 1970.

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Solid-state source replacement

By Mike Wohrle
Microwave Technician, Falcon Cablevision

Does it seem like the only time equipment failures occur is after normal business hours when access to spare parts is usually limited? If so, and your outage is a failed high-power solid-state source in an outdoor broadband high-power microwave transmitter, don't worry. You do have a way out of this problem if you have a receiver with cable backup.

The setup

My tests were conducted on the Hughes HPOLE-112 transmitter, which represents the majority of outdoor transmitters in use today. This transmitter is loaded with 30 channels at an output of -2.8 dBm per channel. Bypass the AML receiver with your standby trunk and remove its solid-state source. Review the section in your owner's manual regarding solid-state source replacements and have a tube of Dow Corning #340 silicon heat-sink compound (or an equivalent) ready. As well, have a clean dry towel to remove the old heat-sink compound. Remember, the phase-lock search relays in the receivers have a limited cycling life, so determine if the receiver's phase-lock loop should be disabled if you expect the transmitter to be off the air for more than several hours.

Figuring power requirements

Next, let's compare the requirements of the high-level mixer in the transmitter. The output level of the high-power source is 21 dBm and is fed directly into a Magic Tee (two-way splitter) with an insertion loss of 3 dB. (You should refer to the schematic of the transmitter in your owner's manual.) One of the splitter outputs feeds the transmit monitor mixer and the other output feeds the mixer for conversion of the VHF channels to microwave. The high-level mixer requires 17 dBm input from the source to produce excellent distortion levels and a low-power source only delivers 14 dBm at its output.

However, by removing the Magic Tee from the output of the solid-state source, we are now only 3 dB low into the high-level mixer. Replace the failed high-power source with the low-power source following the manufacturer's recommendations on solid-state source replacement. As always, when working with microwave radio energy, take care not to expose yourself (especially your eyes) to open, active microwave frequency-generating equipment. Next, remove the Magic Tee and feed the low-power source directly into the mixer. You will have to carefully reshape the semirigid coax to accomplish this. Acceptable distortion levels are maintained even though we are now 3 dB lower into the mixer.

Since we removed the Magic Tee, no conversion back to VHF for level monitoring can be made at the transmitter. A power meter must be connected to the transmitter's main output to set the pilot tone power level. (Be sure to turn off the waveguide pressurization equipment before doing this.) Also, make sure to remove the VHF channels from the transmitter input to enable you to accurately set the pilot tone level. Set the pilot tone 1 or 2 dB lower to assure that you don't exceed any Federal Communications Commission operating limits. Be sure to log all of these activities in your station log book.

Verification

Verify with the TM-5 test box that the transmitter has reached acceptable performance operating parameters, paying close attention to temperature (which has probably totally cooled down by now), source phase-lock voltage, source alarm and frequency. The VHF channels can now be set by matching them to the pilot tone level at an active receiver.

This method works as a *temporary* solution to an outage situation until the proper equipment can be obtained to restore the transmitter to proper operating specifications. **BTB**

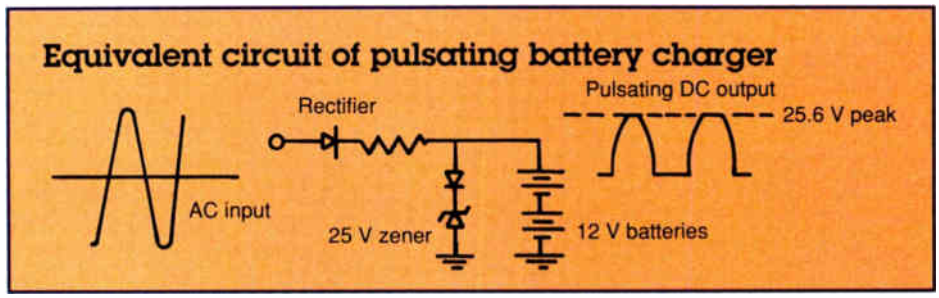
References

1) Hughes Microwave Products, *AML-HPOLE-112 Installation and Maintenance Manual.*
2) Hughes Microwave Products *AML-LNBBR-232 Multichannel Receiver Installation & Maintenance Manual.*

A special thanks to Dane Walker and Jim Bishop at Hughes Microwave Products for their help in preparing this article.

Defining standby battery failures

By Jud Williams
Owner, Performance Cable TV Products



About this time every year, cable systems go through their annual standby power supply battery check and find a large percentage of them dead or dying. Let's explore reasons for premature battery failure and their causes.

Battery types

For our discussion, lead acid batteries may be broken down into three types: the flooded wet cell, the absorbed glass mat recombinant type and the gel cell recombinant type. The wet cell, the type we are most familiar with, has its electrolyte in liquid form and may either be sealed or have vent caps for adding water.

The absorbed glass mat is a recent development and is constructed with fiberglass matting between the plates, which contains absorbed acid. The gel cell is the most recent development and has its electrolyte in the form of a jelly-like substance. Both of these batteries were designed to be spill-proof and some have earned UL approval. It should be noted, however, that recombinant batteries generate significant internal heating during the recharge cycle.

Why batteries fail

Batteries are built very ruggedly and under proper care should be expected to last five years or more. So why do they fail so often in the field? Apparently, three factors are at work: temperature, charging methods and location. These factors often work together and compound the chances for premature failure.

Take temperature, for example. When combined with a high charging rate, grid corrosion increases. This form of deterioration is similar to electrolysis. Say the ambient (surrounding) temperature is elevated, and the charge rate is high and the batteries are situated in a three-battery system with one sandwiched between the others. If they are a type that generates heat during the recharge cycle, significant deterioration can take place (with the middle battery usually suffering the most).

Another thing that takes place inside batteries is sulfation. This may be compared to electroplating. A film gradually collects on the plates of the battery, inhibiting the transfer of ions during charge/discharge. This results in reduction of battery capacity. Sulfation takes place while the battery is being trickle charged by excessive float current. It also takes place when the battery is in storage. This is called stand loss.

Charging solutions

One thing battery manufacturers cling to is their choice of charge voltage. We are told that for a battery to be fully charged, it must have a "surface charge," which is the amount of voltage a battery is charged to in excess of the open circuit voltage. OCV is the level a battery reaches once it is disconnected from the charger and allowed to rest. The OCV may be 12.8 volts while the charging voltage may be as high as 13.8 volts, as recommended by the battery manufacturer.

One consequence of charging wet cells excessively is that gassing begins when the terminal voltage reaches 13.8 volts. If the charge voltage reaches 15 volts, gassing becomes excessive. The thing to be concerned about is the hydrogen and oxygen being released can unite with explosive force. The other problem is the battery will dry out quickly, causing it to ultimately fail.

The question is, what can be done to minimize the destructive forces batteries are being subjected to? Solutions include: limit the float current during trickle charge so the battery does not become overcharged; or ventilate the batteries by allowing space between them or possibly relocating them.

There are several power supplies arranged so that the batteries are in the top portion of the cabinet. In my opinion this is not healthy for the batteries because, with the ferroresonant power supply below, the generated heat keeps the batteries at an elevated temperature regardless of the outside temperature. To correct this, it may be possible to move the power supply module into the upper compartment and relocate the batteries to the lower shelf.

As far as the charger is concerned I'm an advocate of using pulsating DC in conjunction with a clipping-type regulator. Refer to the accompanying figure for a simplified equivalent circuit of such a battery charger. The AC is rectified to produce pulsating DC, which is clipped to a predetermined level. The peak of the pulsating signal is adjusted to the OCV of the batteries, which is 12.8 volts per battery. The key to the pulsating DC is the absence of an electrolytic filter capacitor.

Such a regulator benefits the batteries in two important ways: 1) the pulsating action (rather than steady-state DC) seems to minimize the formation of sulfation and 2) the peak charge voltage eliminates the possibility of overcharging the batteries, thus reducing the activity of grid corrosion, and the scheme inherently limits the float current even at high temperatures.

Tests on a sampling of batteries subjected to this type of charger after two years in the field have shown that their reserve capacity was the same as when the batteries were installed new. The significance of this is that the batteries were exposed to a real life situation rather than monitored in a laboratory as so often is the case.

I feel that batteries are not the real culprits causing standby power supplies to fail, but it is very possibly poor maintenance or improper charging that are putting them under undue stress. **BTB**

Labs has dual role in assault on multipath

Even though multipath interference is a phenomenon of over-the-air broadcast TV, the cable industry just can't seem to escape its impact.

Multipath occurs when signals originating from a terrestrial transmitter arrive at a receiving antenna not only directly but also indirectly, microseconds later, after bouncing off buildings, mountainsides, or other physical obstructions. The late-arriving signal creates the "ghost" (sometimes a hazy edge, sometimes a very distinct duplicate picture) overlaid as either a positive or negative image.

As retransmitters of local over-the-air signals, cable operators have routinely engineered their systems to minimize signal impairments caused by multipath. This is done by the skillful positioning of directional antennas, sometimes above obstructions and sometimes at considerable distance from the headend itself. Occasionally, cable operators create simple phase cancellation networks by balancing together signals from more than one antenna — a sort of non-electronic ghost cancelling system. But sometimes, despite cable operators' best efforts, multipath ghosting has been uncorrectable, and has been retransmitted to subscribers.

Thus, quite a few cable systems would benefit from the availability of more sophisticated ghost cancelling techniques. The research project described in this article should help make such equipment available.

But the major beneficiaries of efforts to develop new, affordable ghost cancelling systems are in non-cable households — a population that's only about 39 percent of U.S. TV households, but is a larger percentage of TV viewers in most of the rest of the world.

Testing in Washington

Beginning last September, five competing ghost cancelling systems underwent a series of tests in Washington, D.C. CableLabs, the research consortium jointly funded by cable operators, took part in these tests along with the National Association of Broadcasters, which is overseeing the research effort. Other participants are the Electronic Industries Association and the Association of Maximum Service Telecasters.

The five systems that were tested were supplied by: the Broadcast Technology Association of Japan; Samsung Electronics; AT&T/Zenith; Philips Laboratories; and David Sarnoff Research Center/Thomson Consumer Electronics. BTA-spec ghost cancelling systems are already available for about $1,000 in Japan.

As part of the Washington test, some area TV stations agreed to add a "training signal" — a waveform that serves as a reference point for ghost cancellation — to their broadcast signal. Each of the five competing systems relies on a different type of training signal and accompanying receiving circuitry.

Any ghost cancellation system, should it be widely implemented, would require that TV broadcasters insert such a training signal into a line of their broadcast signal's vertical blanking interval. The process is a simple one, requiring only the purchase of some programmable read-only memory (PROMs) with a waveform digitally stored in them and insertion of the PROMs into a test signal generator that the station in most cases already owns and uses.

The ghost cancelling system in the TV set cleans up the incoming signal by rejecting the multipath interference. With the training signal as a reference point, the ghost canceller uses a microprocessor to mathematically analyze an incoming signal to precisely measure any multipath impairments. Then, a signal that is the electronic "mirror image" of the ghost is created and added into the impaired signal, thus "cancelling" the original ghost.

The Washington field tests, plus some follow-on lab testing at the Canadian government's Communications Research Center in Ottawa and analysis of the resultant data, should be completed by June, said Craig Tanner, CableLabs' vice president of advanced TV projects. A few months later, the advanced TV systems committee is expected to recommend to the Federal Communications Commission a standard for ghost cancellation.

Finally, TV set makers are expected to produce and sell sets that contain ghost cancelling circuitry. These sets will sell at a premium, but the premium is expected to decline over time although Tanner predicts it "will not decline enough to disappear in the price of the TV set for many years."

Why CableLabs participated

A major reason for CableLabs' participation in the Washington tests was to determine what effect, if any, the different ghost cancelling systems have on signals transmitted over cable systems, said Tanner. CableLabs conducted a series of tests, beginning in late October 1991, to measure these effects so it could add its specific input as to which system, if any, is favored by the cable industry.

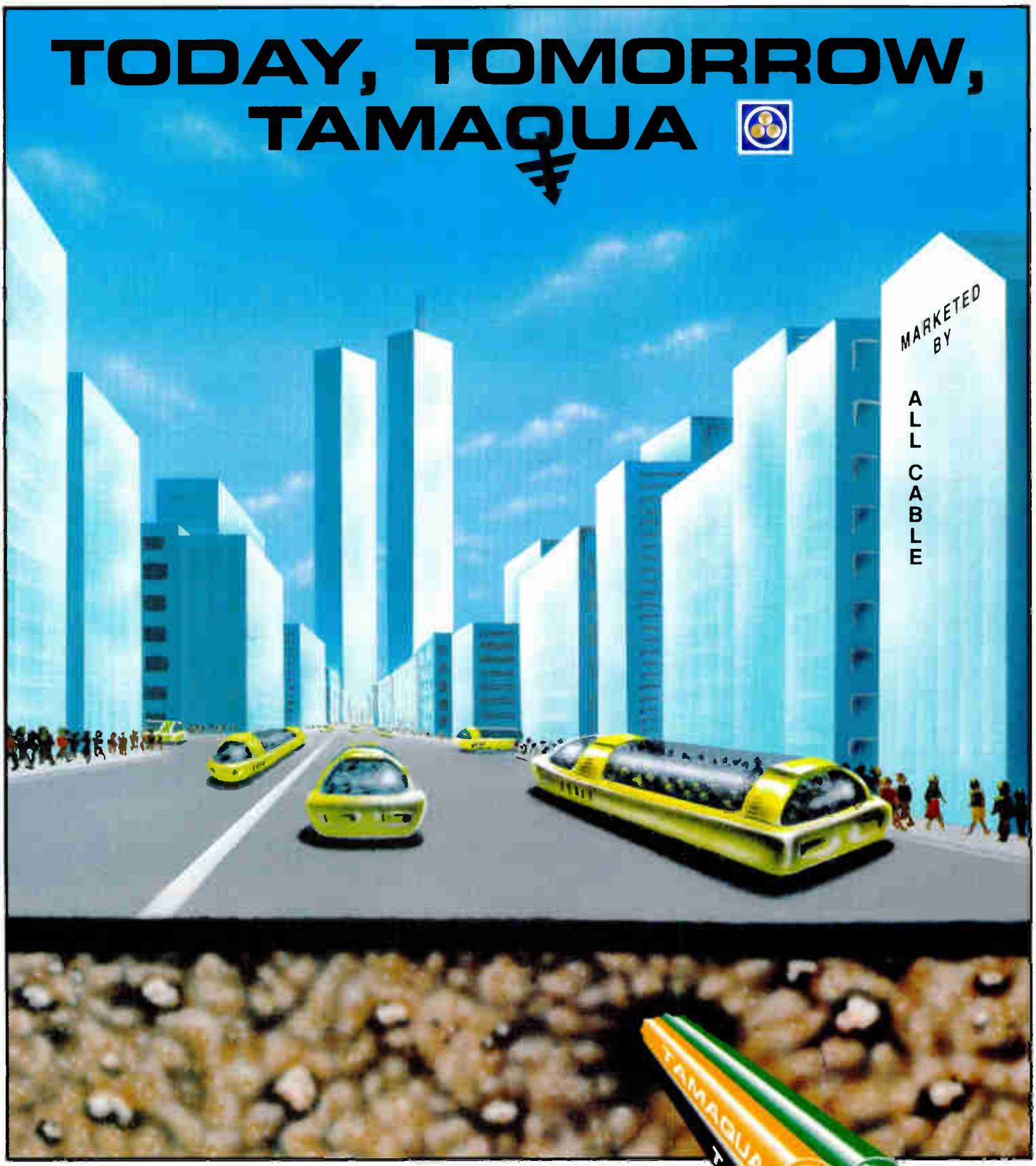
Although cable systems don't generate "ghosts" as such, they do generate microreflections — small and generally unnoticeable signal impairments caused by minute echoing of signals inside a cable system. A given ghost cancelling system might have no visible effect on these microreflections, it might diminish them, or it might make them worse, said Tanner. It is even conceivable, though unlikely, that a ghost canceller could misinterpret distortions in a cable system and end up adding ghosts to signals, Tanner added.

CableLabs (based on its own research and work done at Rogers Cablesystems in Vancouver, Canada) believes that the approach to ghost cancelling that is eventually adopted is not likely either to affect cable microreflections noticeably or to cause ghosting. Even if a ghost cancelling system did have such adverse effects on cable transmission, it presumably can be designed so it can be disabled, either manually or automatically, when used by a cable viewer, Tanner noted.

In the most-likely instance — that ghost cancellers don't improve cable reception (because there are no ghosts present) — CableLabs wants to make sure that this message is clearly communicated to consumers, said Tanner. It would be inconvenient and maybe even costly for cable operators to have to face the ire of customers who

(Continued on page 92)

TODAY, TOMORROW, TAMAQUA



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Reader Service Number 40

abc TeleTraining's "Fiber Optic Cable — A LightGuide"

By Ron Hranac
Senior Technical Editor

The Society of Cable Television Engineers' fourth annual fiber conference, "Fiber Optics Plus '92," was another success with nearly 600 attendees flocking to San Diego for an update on fiber and emerging technologies (see the related story in "SCTE News" on page 18). I attended the Southern California confab, as well as a standing room only fiber seminar in Phoenix, Ariz., sponsored by the SCTE Cactus Chapter the day after the national conference. There is no question that fiber has been accepted by our industry with open arms.

This month's "Lab Report" is departing from the usual equipment evaluation to provide a look at a training publication that complements the many fine materials already available on fiber. I obtained a copy of abc TeleTraining's *Fiber Optic Cable — A LightGuide* by James Refi of AT&T Bell Laboratories, and put it through my paces.

The publisher

abc TeleTraining has been providing technical training manuals to telecommunications (primarily the telephone industry) since 1942. The company also provides related training on audio cassettes, videotapes, computer-based training disks, home-study programs, as well as instructor-led courses at scheduled seminars or private on-site workshops.

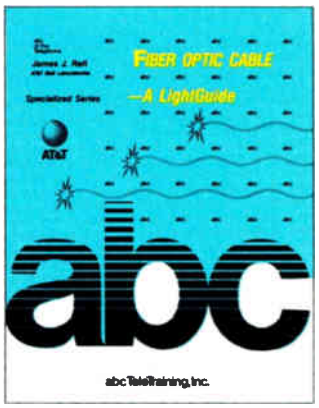
The company's abc series of training manuals are often published in both softbound and hardbound editions, and are written in an easy to follow tutorial style that abc TeleTraining calls Understandable Technology. My 208-page review copy was one of the softbound editions, proving to be a good briefcase companion at 8-1/2 x 11 inches and a little over 1/2-inch thick. At the time of my review, the softbound edition was available from the publisher for $34.95 ($49.95 for the hardbound version) plus $3 shipping.

The author

Refi, a distinguished member of the technical staff at AT&T Bell Laboratories in Norcross, Ga., has been with Bell Labs since 1966, and holds a B.S.E.E. from Villanova University in addition to an M.S.E.E. from Polytechnic University. When he started with AT&T, his initial work was with coaxial and multipair cables, and he authored a number of papers on such things as pair unbalance phenomena, lightning surges and cross talk.

In 1980 Refi won the best speaker award at the 29th International Wire and Cable Symposium for his presentation on cross talk in multipair cable. In 1982 he switched interests from copper to glass cables, later specializing in field and lab measurements. A prolific writer, Refi has published over 15 papers on field measurements, bandwidth, dispersion and fiber-to-the-home. You may have read some of his handiwork in *CT*. He also holds a patent on a communication system using mode stripping.

Given that impressive background, you'll find that Refi's writing style is easy to understand without becoming overly simplistic. He plugs in the occasional mathematical formula to keep the Ph.D.s satisfied, yet doesn't attempt to write at a level that requires translation by a Ph.D.



The book

The Understandable Technology concept used by the publisher involves more than just an easy-to-comprehend writing style; it's really a unique self-study format.

For example, at the beginning of each chapter is an outline of the chapter, objectives and preview questions. Each chapter concludes with a dedicated summary, followed by a "terms to remember" section (you are asked to write the definitions in your own words), review questions (answers are provided in the back of the book), and a space to jot your own comments and notes.

Let me assure you that the material in this book is reference quality. The 16 chapters very thoroughly cover the subject of fiber-optic cable from a basic engineering perspective, starting with what optical fibers are, and progressing through loss, bandwidth (two chapters are devoted to this), mechanical properties, the fiber manufacturing process, cable types, factory testing, installation, splicing, and field testing. Reliability and maintenance, hostile environments and specialty fibers also are covered. The book includes useful metric conversion data, an eight-page glossary, a comprehensive list of references, and an index. You'll find a generous use of top-notch illustrations, figures, tables and photographs.

Fiber Optic Cable — A LightGuide is about optical fibers and fiber cable. It is not about LEDs, lasers or photodetectors, nor is it about the benefits of AM fiber for CATV systems. With this book you will gain a good knowledge of the physical medium of fiber optics, effectively communicated in the author's understandable style.

Comments

AT&T's Refi did a god job of keeping the book's contents for the most part generic. There are mentions of AT&T fiber cable, but you'll also find Siecor, Northern Telecom, General Cable and Pirelli. In the fiber manufacturing chapter there is a good description of AT&T's modified chemical vapor deposition (MCVD) process, along with Corning's outside vapor deposition (OVD) and NTT's vapor-phase axial deposition (VAD) processes.

Fiber Optic Cable — A LightGuide is one publication you should seriously consider for your bookshelf. It can easily serve double-duty as a training aid and an engineering reference. The material is current, since the book was published in 1991; given the subject matter, I don't anticipate it will be rendered obsolete any time soon.

For more information, contact abc TeleTraining Inc., P.O. Box 537, Geneva, Ill. 60134; (800) 222-4123 or (708) 879-9000. **CT**

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Reader Service Number 50

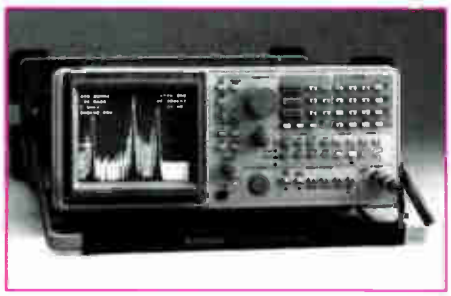
PRODUCT NEWS

Fault finders

Now available from 3M is a new family of optical fault finders, the Photodyne 5200 series. Units operate in 850, 1,300 and 1,550 nm for short range/high resolution and long-range applications. The Photodyne 5240XF, 5260XF, 5262XF and 5262XFA units operate on single-mode fiber and the 5242XF operates on multimode fiber. All units can detect multiple faults and provide a go/no-go splice qualification.

The sets may be connected to any termination point on a fiber link and the preset factory fault threshold of 3 dB may be manually changed, ranging from 0.5 to 6 dB. The products automatically scan the fiber link using an auto-ranging feature, permitting location of any reflective or non-reflective fault as close as 7 m and as far as 82 km. The units weigh 8 pounds and measure 7 (height) x 11 (width) x 7.5 (depth) inches.

Reader service #208



Spectrum analyzer

Tektronix announced its Model 2711 spectrum analyzer, which incorporates many features of the company's recently introduced Model 2712 spectrum analyzer in a compact, 22-pound package. The Model 2711 has 80 dB display dynamic range, sensitivity to -129 dBm, true analog display, and digitally stored waveform display.

Other standard features include TV line and field triggering, built-in measurement functions for carrier-to-noise, occupied bandwidth, signal search, and FM deviation. As well, audio demodulation and a headphone jack are included to aid signal monitoring and identification. Options available include a video demodulator that permits viewing of any video line as well as rasterized TV images in NTSC, PAL or SECAM standards. The demodulator's video and sync invert functions make it compatible with C- and Ku-band downconverted satellite signals. A built-in frequency counter, a 1405 TV sideband adapter interface, and an inverter/battery pack also are available as options.

Reader service #180

Fiber power meter

Noyes Fiber Systems introduced the Model OPM1-4 optical power meter designed specifically for CATV. The unit offers a dynamic range of 16 to -45 dBm and is calibrated at 1,300 and 1,550 nm. Connection to the unit is made via the universal adapter design accommodating all popular connector styles. An instruction manual and carrying case for rugged field operation come with the product.

Reader service #207

OTDR

The Model 6000 all-purpose optical time domain reflectometer from Photon Kinetics combines high resolution and long-range distance measurements in one optical module, eliminating the need for more than one OTDR. The unit allows all the splices in an optical fiber link to be measured in seconds, with the measurements summarized in a convenient loss table. This table lists all the splices in the fiber, their location, splice loss, reflectance and the attenuation (dB/km) between splices.

Splices or connectors with a reflectance value of up to -20 dB can be measured accurately without requiring the operator to attenuate the signal. The product has a built-in 3.5-inch disk

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Reader Service Number 52

drive for storage of measurement results and the company's OTDR emulation software makes it possible to analyze stored data on a personal computer. A built-in thermal printer offers fast hard copy of measurement results.
Reader service #206

Impedance bridges

Wide Band Engineering Co. announced a 1-900 and 1-1,000 MHz variable impedance bridge that is primarily for return loss testing of coaxial cable. The Model A56UTD has directivity of 40 dB minimum throughout its 1-900 MHz range. The directivity in the 1-500 MHz range is 45 dB minimum. The product comes with precision fixed termination and measured lab data on the unit with the termination.

CableLabs' Report

(Continued from page 86)

bought ghost cancelling TV sets or VCRs, expecting them to improve cable reception, only to find that they had no impact on picture quality. While working for accurate disclosure of what ghost cancellers can and cannot do, CableLabs will encourage manufacturers to produce commercial-grade ghost cancelling devices for use in cable headends as soon as possible.

Cancellers — when?

Tanner predicts that these ghost cancellers may become available within about two years, priced reasonably for headend applications. Since over-the-air channels often have huge viewing audiences, he added, the ghost-free signals are likely to be noticed and appreciated by large numbers of cable viewers.

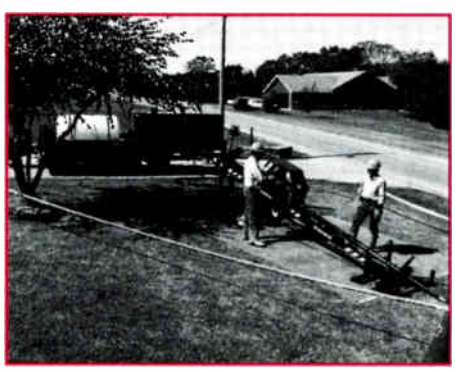
"We are absolutely convinced that ghost cancellers have a positive application at the headend, to correct pictures before they enter the cable distribution system," said Tanner. "We're not yet certain that there's any reason for their use in TV sets owned by cable subscribers." **CT**

The Model A56UTD/S variable impedance bridge has directivity of 40 dB minimum throughout it 1-1,000 MHz range and it comes with a precision fixed termination and measured lab data as well. The bridges are available in 50 or 75 ohm impedance.
Reader service #205

RF switch

The new APSS-1 RF from Trilithic is a rack-mounted, A/B-type RF switch that automatically switches to a backup RF source whenever the primary RF source is interrupted. It is compatible with any signal in the 5 to 600 MHz range, making it ideal for RF backups for fiber trunks in CATV systems, according to the company.

It continuously monitors the primary signal source and switches to the secondary source if signal power falls below a user-settable level. When signal levels are restored, the unit automatically returns to the primary source. The basic product monitors all signals connected to the primary input port, but can be modified to monitor a single frequency by adding an optional RF filter. The switch is housed in a 1.75-inch rack-mount enclosure. Front panel LEDs indicate the source currently selected and a front panel switch allows manual operation.
Reader service #202



Boring equipment

An improved version of the 4/40 Jet Trac guided boring system was introduced by Ditch Witch. It has more power and increased hydraulic capacity to bore faster in a wider variety of soil conditions.

The system's power package has 30 percent more horsepower than previous models and new hydraulics increase pullback and rotational torque by 80 percent. The electrical strike system, which is standard, is the most comprehensive one on the market, according to the company.
Reader service #204

Connector waterproofing

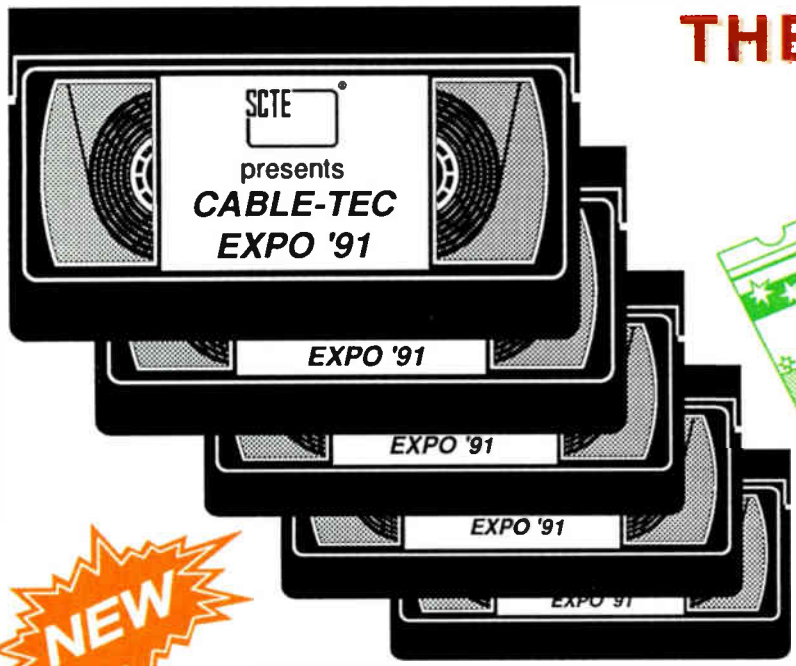
STUF (silica Teflon unionizing filler) from Cross Devices is a non-hardening, high-purity, all dielectric, non-water soluble filler, specifically formulated to simulate the dielectric properties of foam polyethylene core coaxial cable. Waterproofing is done by filling the cap end of any assembled coax connector and tightening. This hydraulically channels protective filler into all internal micro-voids and ports of moisture infiltration within the connector assembly. Teflon and anti-oxidation ingredients protect active internal connector components from moisture and corrosion.

All components of the filler are long-term compatible with cable materials and contain no silicones that can cause hardening and cracking of cable plastic sheathing. The compound is said to be very temperature-viscosity stable and is workable over all temperature extremes. The product uses a large percentage of hollow glass microspheres (3-5 micron diameter). These microspheres lower the density and dielectric constant of the compound, so as not to alter the connection impedance and cause unwanted signal losses. Each tube of the product will waterproof 100 F-connectors or more.
Reader service #203

Amplifiers

A new series of serial digital video distribution amplifiers was developed by Leitch with two modules currently available: the VSE-6800 and VSD-6800. The VSE-6800 provides eight re-clocked outputs and automatic equalization for up to 1,000 feet (300 m) and can accommodate both serial D2 (143 Mb/s or 177 Mb/s) and D1 (270 Mb/s), automatically selecting the appropriate operating frequency. LEDs on the front indicate the standard in which the DA is being used and the presence of input, data errors and power. The VSD-6800 is a simple fan-out module with eight outputs.

Two frames are available to accommodate any mix of DAs. The 1RU FR-6801 can hold four DAs. The 2RU FR-6802 can handle 10 DAs with redundant power supply, which the company says sets a precedent for density in serial distribution — 80 outputs from a single 2RU frame.
Reader service #200



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GUEST COLUMN

Comments on FCC proposed rule making: CATV technical and operational requirements

The following was filed with the Federal Communications Commission on Nov. 13, 1991, as a comment on the proposed rule making in the matter of cable TV technical and operational requirements, "MM Docket No. 91-169."

By Isaac S. Blonder
President, Blonder Broadcasting Corp.

The initiative by the commission to review the technical standards for cable TV may have fortuitously opened the door to achieving a commonality with the international cable standards as proclaimed by the International Electrotechnical Commission publication *728-1*.

Although the United States does not officially subscribe to the IEC standards, our electronic industry participates in the deliberations through the United States National Committee of the IEC. I was honored to be appointed, by the USNC, as the technical advisor to the IEC Subcommittee 12G (cabled distribution systems).

728-1 is 185 pages long, so I intend only to compare the FCC and IEC standards where there has been concern by the cablers, as reported in the press, that the standards are unduly confining. It is my belief that the excellent and impartial standards of 12G, established after long years of meetings and intense scrutiny by the highly qualified participants, will be acceptable to all of the petitioners appearing before the commission:

- Minimum signal level at the TV set — IEC: -3 dBmV (30-300 MHz), 0 dBmV (300-1,000 MHz); FCC: 6 dBmV.
- Minimum carrier-to-noise ratio at the TV set — IEC: 42 dB; FCC: 43 dB.
- Maximum differential gain — IEC: 10 percent; FCC: 20 percent.
- Isolation at any signal frequency between two system outlets — IEC: 22 dB; FCC: 18 dB.
- Frequency difference between vision and sound carriers — IEC: 4.5 MHz ± 2 kHz; FCC: 5 kHz.
- Chrominance-to-luminance delay inequality — IEC: 100 ns; FCC: 150 ns.

The remainder of the proposed standards are substantially in agreement with the IEC figures. It is well to mention that the average time to process any modification of an IEC standard is four years. **CT**

"It is my belief that the ... standards of (IEC Subcommittee) 12G ... will be acceptable to all of the petitioners appearing before the commission."

BOOKSHELF

The following videotapes are available by mail order through the Society of Cable Television Engineers. Prices listed are for SCTE members; non-members add 20 percent when ordering.

☛ *Developing a Preventive Maintenance Program* — Ron Hranac, then of Jones Intercable, now with Coaxial International, discusses one of the most important aspects of subscriber satisfaction: system preventive maintenance. Recommended practices for the reporting and correction of system problems are addressed in this seminar, which also includes maintenance procedures for correcting potential problems before they occur. (1 hr.) Order #T-1025, $45.

☛ *Choosing Advanced Amplifiers for Your Cable Television System* — Herb Longware of Magnavox CATV Systems discusses the theories behind push-pull, feedforward and power doubling amplifier technologies. These three technologies are then evaluated as to their advantages or disadvantages in a wide variety of plant design applications. (30 min.) Order #T-1026, $35.

☛ *SCTE Chapter Development Workshop* — SCTE's Ralph Haimowitz discusses recommended procedures for starting a local SCTE meeting group and offers tips he has used in presenting quality seminars to area techs and engineers. Order #T-1027, $20.

Note: All videotapes were produced prior to 1988, are in color and available in the 1/2-inch VHS only. Videotapes are available in stock and will be delivered approximately three weeks after receipt of order with full payment.

Shipping: Videotapes are shipped UPS. No P.O. boxes, please. SCTE pays surface shipping charges within the continental U.S. only. Orders to Canada or Mexico: Please add $5 (U.S.) for each videotape. Orders to Europe, Africa, Asia or South America: SCTE will invoice the recipient for additional air or surface shipping charges (please specify). "Rush" orders: A $15 surcharge will be collected on all such orders. The surcharge and air shipping cost can be charged to a Visa or MasterCard.

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KEEPING TRACK

David Pangrac was appointed vice president, engineering of **American Television and Communications Corp.** Formerly he was ATC's director of engineering and technologyy.

Riley

Jerry Conn Associates promoted **Diana Riley** to senior account manager. As well, the company announced that **Trav Neumann** started in his position as director of sales and marketing. Formerly he was a regional manager for a major test equipment manufacturer.

Neumann

Cable Television Laboratories announced it hired **Dorothy Gill Raymond** as general counsel, a new post. Previously she was with WestMarc Communications.

Also, CableLabs announced **Majid Chelehmal** was added to the staff as a digital systems engineer to work in the advanced TV laboratory group effort on digital transmission. He worked with Graphic Communication America previously.

Finally, **Frank Wimler** was promoted to senior electronics technician. He works in the Boulder, Colo., laboratory with the headend. His prior position with CableLabs also was in the lab.

H. Marvin McNeil, manager of standards engineering for Siecor Corp., received the **Electronics Industry Association**'s Engineering Award of Excellence for 1991. He was recognized for his contributions in developing standards for the fiber-optic industry.

Gilbert Engineering announced that **Maurice Covino**, its former director of international business development, was named president director general of SAE, a French CATV connector manufacturer recently acquired by Gilbert.

Magnavox CATV Systems made several appointment announcements.

Thomas Towne was named vice president of operations. He was vice president of manufacturing at Laser Magnetic Storage.

Raleigh Stelle joined the firm as international sales manager. He was executive vice president and CEO of Valco Inc. previously.

Also, Magnavox appointed **Charles Conner** manager of major accounts. He formerly was vice president of sales for C.J. Electronics.

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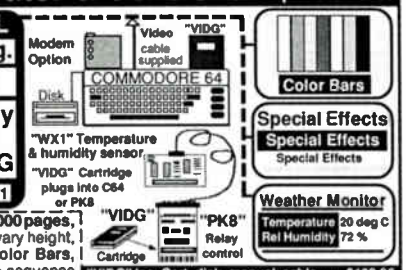

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CALENDAR

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3: SCTE Satellite Tele-Seminar Program. To air from 1 to 2 p.m. ET on Transponder 6 of Galaxy 1. Contact (215) 363-6888.

3: Optical Networks International Fiberworks '92 seminar, ONI Training and Product Development Center, Englewood, Colo. Contact Rand Reynard, (800) FIBER ME.

3-5: SCTE Technology for Technicians II national seminar, Holiday Inn, Fairfield, Calif. Contact (215) 363-6888.

3-6: Siecor seminar, fiber installation, splicing, maintenance and restoration, Hickory, N.C. Contact Lynn Earle, (704) 327-5539.

3-7: Optical Society of America, IEEE Electro-Optics Society and IEEE Communications Society Optical Fiber Conference '92, San Jose, Calif. Contact (202) 223-8130.

4: Idaho Cable Television Association winter convention and legislative meeting, Owyhee Plaza, Boise, Idaho. Contact (208) 345-5660.

4-5: NCTI seminar, OSHA compliance, Austin, Texas. Contact (303) 761-8554.

4-6: C-COR seminar, basics of fiber optics, Orlando, Fla., area. Contact Kelly Jo Kerstetter, (814) 231-4422.

4-5: South Carolina Cable Television Association winter meeting, Marriott-Downtown, Columbia, S.C. Contact Nancy Horne (404) 252-2454.

5-6: SCTE Sierra Chapter vendor show (in conjunction with national SCTE seminar), Holiday Inn, Fairfield, Calif. Contact Eric Brownell, (916) 372-2221.

5: SCTE Ark-La-Tex Chapter seminar, Shreveport, La. Contact Robert Hagan II, (903) 758-9991.

5: SCTE North Country Chapter seminar, Sheraton Midway, St. Paul, Minn. Contact Bill Davis, (612) 646-8755.

5: SCTE Palmetto Chapter seminar, SCTE update, technical standards and compressed video, Marriott Hotel, Columbia, S.C. Contact Melanie Burbank-Shofner, (803) 777-0281.

6: SCTE Great Plains Chapter seminar, BCT/E Categories V, VII and BCT/E exams to be administered, Crown Court Quality Inn, Bellevue, Neb. Contact Jennifer Hays, (402) 333-6484.

7: SCTE Greater Chicago Chapter seminar, CATV 1992 (national and state perspectives) and SCTE update, Quality Hotel, Palatine, Ill. Contact Bill Whicher, (708) 362-6110.

7-8: Society of Motion Picture and Television Engineers 26th annual conference, Westin St. Francis Hotel, San Francisco. Contact Alan Ehrlich, (914) 761-1100.

11: SCTE Central Illinois Chapter, BCT/E exams to be administered, UAE, Peoria, Ill. Contact John Heck, (309) 353-8777.

11: SCTE Desert Chapter seminar. Contact Chris Middleton, (619) 340-1312, ext. 258.

11: SCTE West Virginia Mountaineer Meeting Group seminar, installation practices and procedures, with annual meeting to be held and election of board members, Ramada Inn, South Charleston, W.V. Contact Ken Gabehart, (304) 965-7026.

11-12: Georgia Cable Television Association 1992 convention, Peachtree Plaza Hotel, Atlanta. Contact Nancy Horne, (404) 252-4371.

11-12: SCTE Chattahoochee Chapter seminar (in conjunction with Georgia cable show), power supplies, alternate access/PCNs, department of transportation rules and procedures, NCTA/FCC proposed technical standards, and BCT/E exams to be administered, Peachtree Plaza, Atlanta. Contact Hugh McCarley, (404) 843-5517.

11-12: SCTE Dakota Territories Chapter installer seminars (consecutive), Ramkota Inn, Pierre, S.D. (Feb. 11), Radisson Inn, Bismarck, N.D.(Feb. 12) Contact Kent Binkerd, (605) 339-3339.

12: SCTE Delaware Valley Chapter seminar, distribution systems and system design theory, Williamson's Restaurant, Willow Grove, Pa. Contact Lou Aurely, (215) 675-2053.

12: SCTE Coastal Carolina Meeting Group seminar, proposed FCC rule changes and system sweeps, Holiday Inn, Washington, N.C. Contact Larry Huffman, (919) 353-0854.

12-14: SBCA Satellite Show, Bally's Hotel, Reno, Nev. Contact (800) 654-9276.

13: SCTE Northern New England Meeting Group seminar. Contact Bill DesRochers, (207) 646-4576.

14: SCTE Wheat State Chapter, BCT/E exams to be administered in Categories I, III, V and VII at both levels, Multimedia Cablevision offices, Wichita, Kan. Contact Mark Wilson, (316) 262-4270.

17: Optical Networks International Fiberworks '92 seminar, ONI Training and Product Development Center, Englewood, Colo. Contact Rand Reynard (800) FIBER ME.

18: NCTI seminar, the dynamics of supervision, Charlotte, N.C. Contact (303) 761-8554.

19: SCTE Golden Gate Chapter seminar, Fairgrounds, Pleasanton, Calif. Contact Mark Harrigan, (415) 358-6950.

20: NCTI seminar, the dynamics of supervision, Cincinnati. Contact (303) 761-8554.

22: SCTE Golden Gate Chapter, BCT/E exams to be administered, Viacom, Pleasanton, Calif. Contact Mark Harrigan, (415) 358-6950.

26: SCTE San Diego Chapter seminar. Contact Kathleen Horst, (213) 831-4157.

26-28: Texas Cable Television Association Texas Show '92, San Antonio, Texas. Contact (512) 474-0966.

Planning ahead

May 3-6: National Show, Dallas. Contact (202) 775-3550.

June 14-17: SCTE Cable-Tec Expo, San Antonio, Texas. Contact (215) 363-6888.

Sept. 8-10 (tentative): Eastern Cable Show, Atlanta. Contact (404) 252-2454.

Sept. 15-17: Great Lakes Cable Expo, Cleveland. Contact (517) 482-9350.

Oct. 13-14: Atlantic Cable Show, Atlantic City, N.J. Contact (609) 848-1000.

March

2: SCTE Satellite Tele-Seminar Program. To air from 1 to 2 p.m. ET on Transponder 6 of Galaxy 1. Contact (215) 363-6888.

2: Optical Networks International Fiberworks '92 seminar, ONI Training and Product Development Center, Englewood, Colo. Contact Rand Reynard, (800) FIBER ME.

2-5: Siecor seminar, fiber installation, splicing, maintenance and restoration, Hickory, N.C. Contact Lynn Earle, (704) 327-5539.

SCTE voting time!

By Wendell Woody
President, Society of Cable Television Engineers

The Society of Cable Television Engineers' annual election is now in progress. All national SCTE members have received their 1992 voting package. Eight of the 15 national board members are being balloted upon. Four of the incumbent directors, Ted Chesley, Vic Gates, Leslie Read and myself, have chosen not to run for this term. Therefore, a minimum of four new 1992 board members are certain (with the possibility of its being eight). The new board members will be seated at the Cable-Tec Expo '92 board meeting in June in San Antonio, Texas.

Alert!

If you did not receive a voting package, perhaps your national SCTE membership has expired. This also would mean that you would not be receiving the new *1992 Membership Directory and Yearbook* later this year. The directory is a momentous document and valued by all members. If you have any cause for concern or questions, call the SCTE headquarters at (215) 363-6888.

Know the candidates

A group of outstanding, well-qualified candidates have been selected by our 1992 SCTE nominations subcommittee, chaired by Jim Chiddix and served by Marshall Borchert, Kenneth Gunter, Dave Willis and Bill Riker.

Our Society's elections are not intended to be an industry popularity contest, and therefore you should know the qualifications, accomplishments and abilities that each candidate brings to the SCTE. Your election package will contain a biography of each candidate. Read and study each carefully and discuss the candidates with others in the industry who may know them better than you. You can even contact the candidates directly to find out where they stand on issues important to you.

One of the three at-large director positions is up for election this year, and each national member may cast a vote for one at-large director. Otherwise, you may vote only for the director in the region in which you reside (your SCTE mailing address).

Referendum vote

Your election ballot also contains a referendum vote that you are requested to exercise. The SCTE national board adopted an action item to utilize the titles of chairman and vice chairman to better reflect the actual positions of the elected board members who serve the office on a voluntary basis. The current title of the Society president will be used to identify the Society's employed head of staff; this action will elevate the current executive vice president, Bill Riker, to a new title of president. The highest ranking SCTE officer will be that of the elected position, chairman of the board.

The SCTE board of directors submits only referendum proposals to the membership for approval on issues that have been fully researched, analyzed and adopted by the board as being in the best interest for the Society. The SCTE board of directors voted overwhelmingly in favor of the officer title changes. The following directors urge you to vote the approval of this meritorious improvement: Wendell Bailey, Ted Chesley, Walt Ciciora, Tom G. Elliot, Tom D. Elliott, Jim Farmer, Vic Gates, Rich Henkemeyer, Ron Hranac, Leslie Read, Diana Riley, Mike Smith and myself.

Polish your boots

Dan Pike is co-chairing the 1992 Expo Program Subcommittee this year, along with Bill Riker. The other subcommittee members are: W.D. "Bill" Arnold, Richard Clevenger, Paul Levine, M.J. Jackson, Roger Brown and Leslie Read. The SCTE national staff, along with this subcommittee, has already been working for several months on the expo, which as mentioned previously will be held in San Antonio in June. The engineering conference and technical workshops will once again provide the ultimate in training and information. Continuing to increase is the number of exhibitors that are limited to equipment- and engineering-type firms. This provides an excellent complement to the training program.

"Why not schedule your corporate engineering meetings just prior to the expo dates (June 14-17) in San Antonio?"

Polish your boots and wear your Mexican sombrero! Expo Evening will be a fun and memorable event. Everyone will ride away from Alamo City alive and a winner.

Plan, budget and schedule for you and your technical staff to attend the expo. Why not schedule your corporate engineering meetings just prior to the expo dates (June 14-17) in San Antonio? Then you'll make the expo part of your program for all your people.

Meeting the members

En route to the SCTE Fiber Optics Plus '92 seminar conference in San Diego, I met with the Southern California Chapter in Santa Fe Springs, Calif. Along with its inspired leaders, Pat Murphy, Tom Kennedy, Richard Olson and Wayne Edel, we acknowledge Tom Colegrove who has been active with this chapter since its beginning. In fact, Colegrove has supported and inspired several meeting groups to get started. The Society is dedicated to the many "Toms" we have working for us throughout the industry. **CT**

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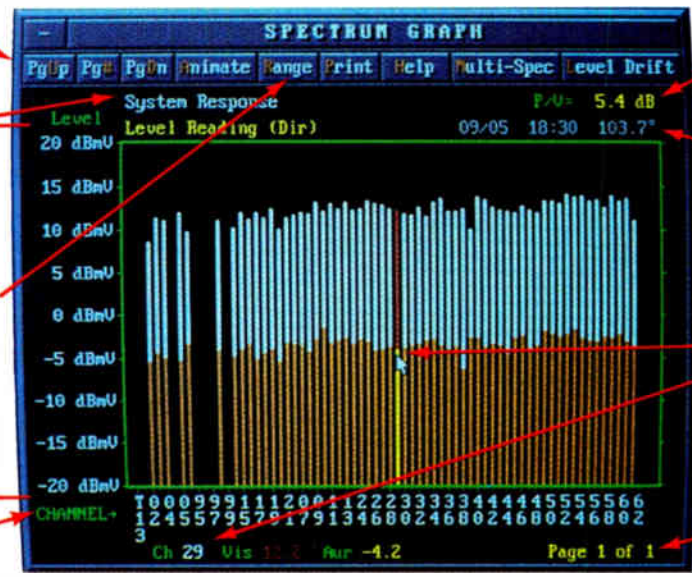

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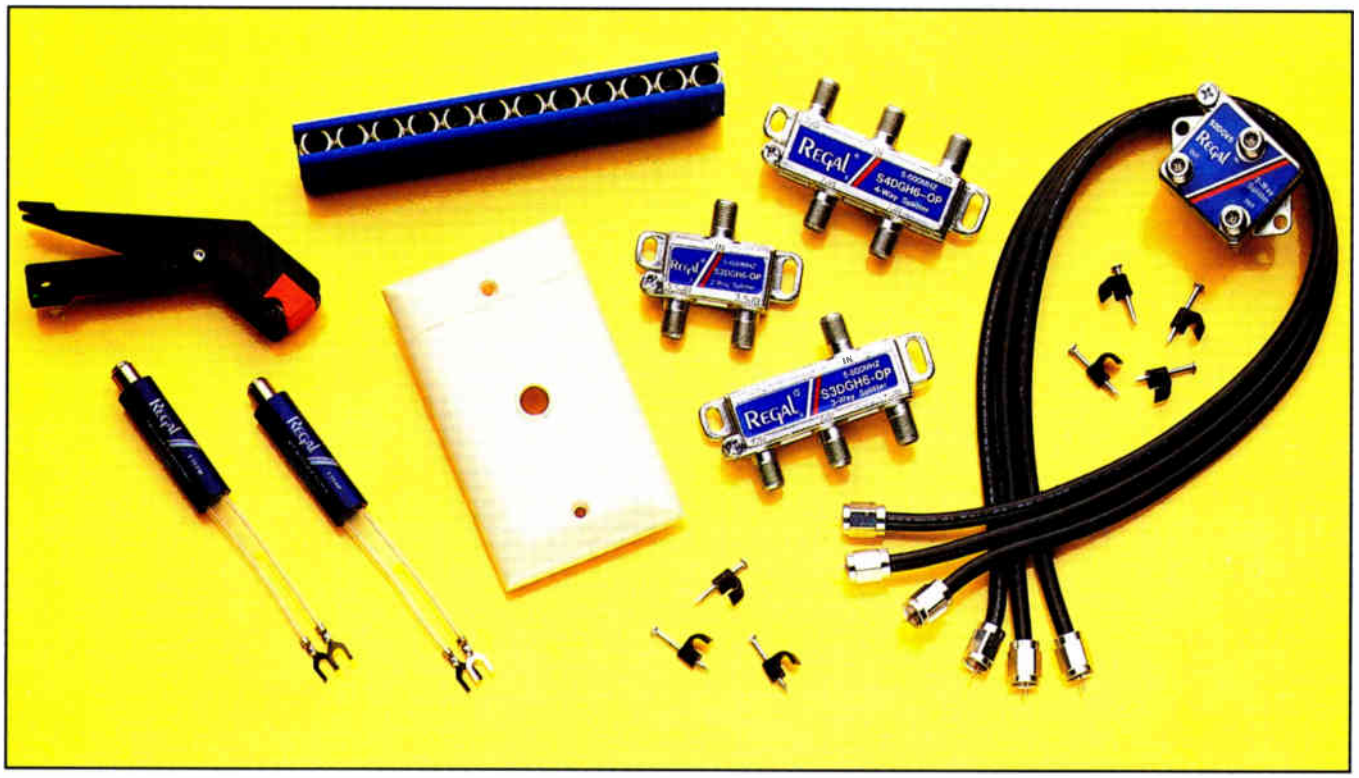

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